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THE OTTAWA NATURALIST.

VOL. XX. OTTAWA, APRIL, 1906. No. 1

THE REPORT OF THE COUNCIL OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 20, 1906.

The past year has witnessed great interest in the work of the Club, as is shown by the large increase in membership. Sixty-two new ordinary members have been elected. The present membership is 293, composed of 285 ordinary members and eight corresponding members.

SOIRÉES.

The programme of Winter Soirées published in the December number of THE OTTAWA NATURALIST has been carried out with some slight omissions and changes in dates. The attendance at all the meetings has been most gratifying

Since the Normal School course has been lengthened to a year, the students have been able to engage in the field work of the Club during the spring and fall months and also to attend the winter soirées The result has been that the students, having become interested in the field work, have attended the soirées almost in a body. The Club realizes that through the teachers it has a most valuable medium of disseminating its influence, and therefore it keenly appreciates the interest that has been displayed throughout the year.

EXCURSIONS.

Sub-excursions were held as usual during the spring and early summer to localities in the immediate vicinity of Ottawa, viz.: Rockcliffe, Blueberry Point, Victoria Park, Leamy Lake, and Beaver Meadow. Rockcliffe Park and Beaver Meadow were again visited in October.

The Council favors the continuance of outdoor work throughout the year, and to that end had planned two snowshoe tramps, which, however, were cancelled for lack of snow. Three general excursions were held as follows : May 27, to Chelsea ; June 10, to Carp ; September 23, to Chelsea. The excursion to Chelsea on May 27 was perhaps the most largely attended excursion in the history of the Club, due to the fact that both the Royal Society and the Carleton County Teachers' Association met in Ottawa during that week. Such distinguished visitors as Dr. C. F. Hodge of Clark University, Dr. A. H. MacKay, Superintendent of Education for Nova Scotia, and Dr. G. U. Hay, editor of the Educational Review, were present and delivered able addresses. Detailed accounts of all the general excursions have appeared in THE OTTAWA NATURALIST.

THE OTTAWA NATURALIST.

Volume XIX of THE OTTAWA NATURALIST, the official organ of the Club, has been published under the editorship of Mr. J. M. Macoun. It consists of twelve numbers which contain in all 249 pages and four plates. The following are among the papers that appear in this volume :

1. A New Marine Sponge from the Pacific Coast of Canada. Lawrence M. Lambe, F.G.S.

2. Notes on Fresh-water Rhizopods. W. S. Odell.

3. Food Value of Certain Mushrooms. Prof. Shutt, M.A , and H. W. Charlton, B A. Sc.

4. Popular Entomology. Arthur Gibson.

5. Glaciation of Mount Orford. R. Chalmers, LL.D.

6. Nesting of Night-hawk in Ottawa. Rev. G. Eifrig.

7. Notes on Fresh-water Shells from the Yukon Territory. Dr. J. F. Whiteaves.

8. Nature's Method of Re-seeding the Red and White Pine. P. Cox.

9. A Naturalist in the Frozen North. Andw. Halkett.

10. Eggs of the Scarlet Water-Mite. Prof. E. E. Prince.

11. Sthenopis thule at Ottawa. Arthur Gibson.

12. Bird Migration. Jas. Bouteiller.

13. Ont. Ornithological Notes (Winter 1904-05). A. B. Klugh.

14. Notes on the Fauna and Climate of the Lièvre River. E. E. Lemieux.

15. Why our Field and Roadside Weeds are introduced species. W. T. Macoun.

16. The Hair-eel (*Gordius aquaticus*). Prof E. E. Prince.

17. The Red-breasted Nuthatch. Wm. H. Moore.

18. On So-Called Silene Menziesii. Ed. L. Greene.

19. A New Northern Antennaria. Ed. L. Greene.

20. A New Goldenrod from Gaspé Peninsula M. L. Fernald.

21. Extracts from Diary of the late Robt. Elliott. W. E. Saunders.

22. Descriptions of New Species of Testudo and Baena with remarks on some Cretaceous forms. Lawr. M. Lambe.

23. Notes on Some British Columbia Mammals. Wm. Spreadborough.

24. The Fly Agaric, and its effects on Cattle. Norman Criddle.

25. Birds New to Ontario. W. Saunders.

26. Eggs of the Fresh-water Ling. Prof. Prince and Andrew Halkett.

27. Eupithecia Youngata. George W. Taylor.

28. Cultivation of Native Orchids. J. H. C. Dempsey.

In addition to these, there have been published several short notes, book reviews, accounts of branch meetings, etc

The series of articles on Nature Study, edited by Dr. Jas. Fletcher, has been continued. In this volume the following papers appear :

1. Nature Study. Dr. Sinclair.

2. The Clouded Sulphur Butterfly. Dr. Fletcher.

3. Short Introduction to some of our Common Birds. Rev. G. Eifrig.

5. Field Work at the Ottawa Normal School Summer Course for Teachers. A. E. Attwood.

4. Ottawa Summer School for Teachers. J. H. Putman.

5. Woolly-Bear Caterpillars. Arthur Gibson.

6. Nature Observations at Home. Prof. Lochhead.

7. Mother Nature and Her Boys. An Institute that brings them together. G. J. Atkinson.

8. The School Garden and the Country School. Geo. D. Fuller.

In all, some 30 articles on Nature Study have appeared in THE OTTAWA NATURALIST during the past three years. They are of a popular and decidedly practical nature, and have added much valuable material to the current literature on this subject. The papers published during the past year have all been contributed by scientists and educationists actively engaged in working out the best courses and methods in Nature Study. 5,500 of each of these papers have been printed in pamphlet form and distributed thoughout Canada ; 2,200 of these go to the teachers of Toronto, 500 to the Macdonald Institute of Guelph for use in the Nature Study Department of the Ontario Agricultural College, and 1,000 to Dr. Robertson, 500 of which are distributed among his Nature Study Instructors in various centres.

REPORTS OF BRANCHES.

Reports showing the work done throughout the year by the various branches have been read before the Club. The report of the Geological Branch has been printed in THE OTTAWA NATURALIST, and the other reports will appear at an early date. Most of the branches are now holding fortnightly or monthly meetings at the homes of the members for the purpose of discussing subjects of especial interest to the respective branches.

ENTOMOLOGICAL BRANCH.

The members of the Entomological Branch have made some notable additions to the local lists during the past summer. Mr. Arthur Gibson made, on July 6, the catch of the year, a perfect specimen of the very rare and local moth *Hepialus thule*, Strkr. Up to the present time this is the only specimen which is known with certainty to have been taken at any other place than Montreal, from which locality the species was originally described and where a few specimens are taken yearly. Mr. C. H. Young has continued his studies of the micro-lepidoptera and has added many new species to the Canadian fauna. All of these have been

described by Mr. W. D Kearfott, of Montclair, N.J., who is making a specialty of these beautiful insects. Mr. W. Metcalfe has continued his studies of the local hemiptera and has added many new records. Mr. J. W. Baldwin made a very remarkable capture of the West Indian moth, *Melipotis fasciolaris*, Hbn. It can only be surmised that the chrysalis of this handsome moth may have been introduced, as has been the case with many other insects, in a bunch of bananas. The Ottawa Fruit Exchange building is close to Mr. Baldwin's house, where the insect was taken in the garden. Six specimens of the handsome elater, *Pityobius anguinus*, Lec., figured in the first Transactions of the Club under the name of *Pityobius billingsii*, were taken by Messrs. Baldwin and Gibson at the electric light on the 28th June. A month later a fine female was taken by Dr. Fletcher, floating on the surface of water, into which it had fallen. Many other insects of more or less interest were taken during the summer and the interest in this branch of work has been kept up steadily. Good work has been done by the leaders in working out life-histories of beneficial and injurious insects.

GEOLOGICAL BRANCH.

Members of the Geological Branch have make special study of some interesting localities in the Ottawa district. The sands and gravels of McKay Lake have been examined and special study has been made of the geology of Strathcona Park, where the excavations in the Utica have afforded an excellent opportunity for studying that formation; the Chazy at Rockcliffe has yielded an excellent series of slabs exhibiting tracks and trails of marine organisms. The most interesting local find, however, was the discovery of a large number of curved hornblende crystals in a vein of mica at Carp. These curved crystals were new to the geologists and hitherto unrecorded in Canada.

BOTANICAL BRANCH.

The Botanical Branch has held fortnightly meetings throughout the year except during the summer months. The most important matter taken up was the publication of a complete list of the plants of the Ottawa district. Since Dr. Fletcher's "Flora Ottawaensis" was published many new species have been added to

local list, and the work of specialists has made a thorough study of the local flora necessary. This list is to be issued as a publication of the Geological Survey. The Botanical Branch invite the co-operation of all local botanists in this work of revision, and would call special attention to the Rosaceæ ; the study of this large order of plants will certainly result in the addition of several species to the local list.

Zoological Branch.

The Zoological Branch held two very profitable meetings during the winter. At the first meeting Prof. Prince read an interesting paper on the function of the swim bladder of fishes, an outline of which appears in the report of the branch. At the second meeting Prof. Macoun pointed out the great amount of work that can be done in procuring specimens of the numerous species of small mammals to be found near Ottawa, and also pointed out the ease with which this could be done.

The report of the Zoological Branch contains a list prepared by Mr. Halkett of the fishes of the Ottawa district preserved in the Fisheries Museum with the localities were they were taken. It also records a number of interesting observations made by members of the branch during the year.

Ornithological Branch.

The Ornithological Branch, although small, consists of a number of enthusiastic workers. Monthly meetings have been held since early last fall at which much systematic work has been planned. The vicinity of Ottawa is to be divided among the members of the branch for active field work, and the antiquated local list published by the Club many years ago is to be thoroughly worked over. Some interesting additions have already been made to the local records, such as the appearance of the Short-billed Marsh Wren, a breeding record of the Screech Owl, and the casual occurence of the Glaucous Gull. The Great Grey Owl, a rare visitor from the north, has been seen this winter. One specimen was secured in East Templeton and another near South March. One of these, a very fine specimen, is now in the collection of Rev. Mr. Eifrig.

Mr. W. E. Saunders of London, who is an active member of

the Club, has done valuable work in compiling a list of birds new to Ontario which have been taken in the Western Peninsula since the issuance of McIlwraith's revised work. This list appears in No. 11 of the volume of the OTTAWA NATURALIST just completed.

The Treasurer's Report shows a balance on hand of $61.62.

A Summer School for Teachers was held in Ottawa last July. Several members of the Club delivered lectures in the Nature Study Course and aided in the field work. Dr. White did practical field work with the class in Physical Geography. Mr. Putman delivered illustrated lectures and conducted experimental work in Botany, Mr. Attwood delivered lectures on minerals and did a great deal of field work, Dr. Fletcher gave two lectures on birds and two on insects, Prof. Prince lectured on Fish Life, Dr. Ami on Ferns, Dr. Saunders on Evergreens, Mr. R. B. Whyte on the pleasures of gardening and other members on various other subjects.

The Council desires to call the attention of the Club to the large number of unbound magazines in the library and would suggest the binding of such of these as a committee appointed to make a selection would consider most worthy of preservation.

The thanks of the Club are again due to Principal White for so kindly placing the Normal School at its disposal, and also to the press of the city for its efforts in furthering the work of the Club.

Respectfully submitted.

T. E. CLARKE,

Secretary.

The Library Committee, acting under instructions from the Council of the Club, has almost completed the arrangement of the periodicals in the Library with the object of having them bound. A good many numbers are missing, and the members who have borrowed them are asked to return them to the Library as soon as they conveniently can, so that the Committee may conclude its work It is hoped that this notice will make it unnecessary to apply directly to those who have the borrowed numbers in their possession.

TREASURER'S STATEMENT FOR YEAR ENDING 20TH MARCH, 1906.

RECEIPTS.

Balance from previous year		$53 43
Subscriptions – 1905-1906	$167 00	
Arrears	65 00	
		232 00
Advertisements in OTTAWA NATURALIST		75 60
Author's extras sold, including separates of Nature Study articles		106 08
OTTAWA NATURALISTS sold, including postage		6 62
Maps of Ottawa sold		85
Proceeds Gen. Excursion to Chelsea, May		21 90
Government Grant		200 00
		$696 48

EXPENDITURE.

Printing OTTAWA NATURALIST, Vol. XIX, 12 Nos., 249 pp.	286 20	
Illustrations	29 92	
Author's extras, including Nature Study separates	147 15	
Miscellaneous printing—wrappers, post cards, etc.	30 08	
	$493 35	
Postage	22 03	
Editor	50 00	
	$565 38	
Less 5 per cent. for cash on printers' accounts	24 30	
		541 08
Secretary		25 00
Treasurer		25 00
Soirée expenses		9 50
Library expenses (binding set of OTTAWA NATURALIST).		6 00
Sundry expenses, postage, etc.		28 28
Balance		61 62
		$696 48

ARTHUR GIBSON, *Treasurer.*

Examined and found correct.

R. B. WHYTE,
A. H. GALLUP, } *Auditors.*

Subscriptions for the new club year, beginning with this number of the NATURALIST, are now due, and should be paid to the Treasurer as soon as possible.

The Treasurer would direct attention to the advertisements in our new volume. Some of these appear for the first time, and members are specially asked to remember these different firms when making purchases. They are all good reliable firms, and, as they are helping the Club by giving advertisements, we should all make it a point to deal with them.

NOTES ON AN INTERESTING COLLECTION OF FOSSIL FRUITS FROM VERMONT, IN THE MUSEUM OF THE GEOLOGICAL SURVEY OF CANADA.*

By H. M. AMI, Geological Survey of Canada.

Amongst the specimens exhibited at the first January meeting of the Botanical Club was a collection of fossil fruits from Brandon, Vermont. These specimens appeared to have been in the collections of the Geological Survey Museum since the days of the late Sir William Logan, having been brought to his attention, it is thought, by the elder Hitchcock in the early fifties. It was in 1853 that these fossil fruits were recorded for the first time by President Edward Hitchcock, in the Amer. Jour. Sc., vol. xv, p. 95 (1853), as occurring in "a bed of brown coal connected with the white clays and brown hematite of the place," referring to Brandon, Vermont, which he had visited in the spring of 1852.

During the visit of the Geological Society of America held in Ottawa in December, 1905, Prof. G. H. Perkins, Director of the State Geological Survey, Vermont, was good enough to look over the collection of these fruits, which were shown to him by the writer, and he there and then undertook to identify every recognizable species, most of which he had himself recently studied, and more particularly described, not only before the Geological Society of America, at the Philadelphia meeting, but also in the Report of the State Geologist for Vermont for the years 1903-1904.

The geological horizon or formation to which these fruits have been referred by many geologists practically agree in ascribing them to the "Lignite Tertiary," the *Brandon Lignite* or Brandon formation, specially designating the horizon or formation to which they are referable. Professor Perkins is inclined to think them as "Miocene Tertiary" in age. Their age was compared by Edward Hitchcock with those of the fossil fruits from the London clay figured by Bowerbank, and he (Hitchcock) further states that "the Brandon deposit is the type of a Tertiary formation hitherto unrecognized as such extending from Canada to Alabama," adding: "This deposit belongs to the Pliocene or newer Tertiary."

* Published by permission of the Director of the Geol. Survey of Canada.

Lesquereux referred the species to the "Upper Tertiary," noting that they agreed specially with the flora of Oeningen, adding: "I have no doubt that the Brandon lignites belong to the same epoch as the upper bed of the lignite of the Tertiary." (Geol. of Vermont, p. 250. 1861.)

From 1861 to 1902, when Prof. F. H. Knowlton's paper on these Vermont lignites appeared in the *Torrey Bulletin* of November of that year, pp. 635-641, plate 25, in which that authority compared the Brandon lignite with the *Pityoxylon microporosum* of Schmalhausen from the Eocene of the Braunkohle of southwestern Russia, naming the Vermont form: *Pityoxylon microporosum Brandonianum*, nothing was written or published concerning these fruits. They are being studied by Dr. E. C. Jeffrey, of the Botanical Department at Harvard at the present time, and in a forthcoming Report of the State Geologist of Vermont it is confidently expected that Dr. Jeffrey's views will be given publicity. Meanwhile, writing of the lignite, Jeffrey states that it "is a species of *Lauroxylon* in a more or less good state of preservation. There is one small piece of coniferous wood and a good deal of dicotyledenous material in which only the medullary rays show any structure."

The shafts sunk through the clay to the lignites have been closed, as, also, the diggings for the Brandon paint in the clays themselves, so that it is practically out of the question now to obtain any more specimens of these fossil fruits from this locality. Formerly, as President Hitchcock pointed out, there were outcroppings of these lignites, but they have been covered up by the dumps and waste materials from the clay pits.

A paper on the "Brandon Clay" appears in the Report of the State Geologist for 1903-1904, by Prof. J. B. Woodworth, pp. 166-173, and in this is given an analysis of the lignite copied from the original description in 1861.

Volatile matter	4.50 %
Carbon	93.50 %
Ash	2.00 %
Total	100.00

Prof. Woodworth then gives notes on the various collections examined from the different Museums of the State of Vermont and

other New England Museums, points out the difficulties in comparing these fruits with those of to-day, indicating that "it is among the tropical and sub-tropical living species that we should expect to find that the most close allies to the Tertiary forms." He also compares a collection of Australian fruits in the University Museum at Harvard with those from Brandon, Vermont, and adds that they closely resemble them.

From pages 174 to 212 of the same valuable Report of the State Geologist of Vermont, Prof. G. H. Perkins himself describes these fruits and accompanies the descriptions with excellent illustrations on Plates lxxv, lxxvi, lxxvii, lxxviii, lxxix, lxxx and lxxxi.

The following is a list of the species identified by Prof. Perkins from the collection in the Geological Survey Museum at Ottawa, Canada, to which is added the number of specimens representing each species :

1. Glossocarpelites Brandonianus, Lesquereux. Fourteen specimens.
2. ,, elongatus, Perkins. Four specimens.
3. ,, obtusus, Perkins. Nine specimens.
4. ,, grandis, Perkins. Two specimens.
5. ,, parvus, Perkins. One specimen.
6. Monocarpelites elegans, Perkins. One specimen.
7. Bicarpelites Grayana, (Lesquereux, sp.). One specimen.
8. Nyssa ascoidea, Perkins. One specimen.
9. ,, Lescurii, C. H. Hitchcock. One specimen.
10. ,, elongata, Perkins. Two specimens.
11. Apeibopsis Heeri, Lesquereux. Six specimens.
12. ,, Gaudinii, Lesquereux. Fourteen specimens.
13. Aristolochia obscura, Lesquereux Eight specimens.
14. Aristolochites majus, Perkins. Five specimens.
25. Sapinoides Americanus, (Lesquereux) Perkins. Six specimens

In all, these fossil fruits, as determined by Prof. Perkins, have yielded sixty-eight specimens distributed in eight genera and fifteen species. They were all identified by Prof. G. H. Perkins, and the Geological Survey of Canada is under special obligations to him for his kindness in looking over the material submitted to him, which he so willingly classified.

As the Brandon formation of clays and lignites is supposed to cross the Canadian boundary, it has been deemed of interest to make a note of the collection which Sir William Logan had obtained years ago, and must serve to throw light upon the geological history of our Eastern Townships.

Ottawa, Jan. 25, 1906.

ON THE STRUCTURE OF ROOTS.

By THEO. HOLM.

It is a general belief that plant-roots exhibit but very few modifications in regard to function and structure, and almost as a rule the histology of this organ is silently passed by in works on plant-anatomy. Furthermore, it is a very common feature of herbarium specimens that the parts underground, for instance the roots, are either totally absent or poorly preserved. It is, therefore, often very difficult to study roots in herbaria, and the student is mostly obliged to secure the material himself and to make alcohol preparations. When roots are dried and pressed they may in some cases be made useful to histological research by being placed in boiling water and then preserved in strong alcohol, but many roots, especially the fleshy ones, loose their delicate structure to such an extent when they are dried and pressed, that they are not suitable for this purpose. If the herbalists would preserve parts of the various organs of plants in alcohol as an appendix to their herbaria, the plants might be studied more carefully and from other points of view than merely systematically.

To give some illustration of the various functions performed by roots, we might refer to a modern and very suggestive paper by our excellent friend Dr. August Rimbach,* in which the following four types are proposed: "nutritive," "attachment," "contractile," and "storage-roots."

Roots of the first type possess no pronounced power of resistance, since they have no mechanical tissues, nor are they contractile nor especially adapted "to store" nutritive matters. They are generally very slender and certain plants possess only this type, for instance: *Dentaria*, *Tulipa*, the *Gramineæ* and many others.

The second type, the attachment-roots, needs no further explanation, and these we know from the epiphytic *Bromeliaceæ*.

The contractile roots have th power of contracting, thus drawing the shoot deeper and deeper into the ground, as for instance: *Scilla*, *Crocus*, *Gladiolus*, some species of *Oxalis*, etc.

Storage-roots are, on the other hand, such roots as possess

* Berichte Deutsch. Bot. Gesellsch. Vol. 17. Berlin 1899.

a large persistent parenchyma in which nutritive matters are "stored." They often become tuberous by the excessive development of this parenchyma, and these are well known from the *Orchideæ : Orchis*, *Spiranthes*, *Platanthera*, etc., also from *Hemerocallis*, *Aconitum*, *Delphinium*, etc.

The structure of such roots offers really a number of interesting modifications, which are very little known so far, and it would be an excellent study to undertake the investigation of their structures, instead of confining ourselves to the other organs alone. It is not, however, an easy matter to study such roots, but by beginning with the more simple types, for instance the annual among the nutritive, the various tissues may be readily perceived and distinguished. The most difficult ones are the tuberous storage-roots, and these must always be studied at the various stages of their growth and during several seasons. There are, also, certain types which are called anomalous, as for instance the beet, which is quite difficult to understand, unless the successive stages have been observed.

With the object of giving some examples of different root-structures we may begin with an ordinary, annual nutritive root of *Streptopus roseus*, of which we have drawn part of a section on Plate I. In this drawing the central cylinder is complete, but the cortex and epidermis is only shown in part. The structure is as follows :

The epidermis (*Ep.*) consists of a single layer and many of the cells are extended into root-hairs (*Rh.*); beneath this tissue is another single layer, the cells of which are quite thickwalled, and this is the so-called exodermis (*Ex.*). The cell-walls are more or less suberized, thus the membranes are almost impermeable to water and render thereby an important protection to the interior tissues. In many cases the exodermis possesses, also, the power of contractility, which may be seen from tangential sections, where the radial cell-walls show foldings or undulations, which continue in the longitudinal direction of the root, resulting in contraction.

Inside the exodermis follows a parenchyma of several layers, the cortex (*C.*); it is in this tissue that nutritive matters are stored in storage-roots. The cells are often loosely connected, thus we

may frequently observe quite broad intercellular spaces, often to such an extent as deserving the term "lacunes," which are very common to roots of plants that grow in moist situations.

The innermost layer of the cortex is differentiated into an endodermis (*End*), the structure and function of which suggests that of the exodermis, and forms a closed sheath around the central cylinder of the root.

Bordering directly on the endodermis, thus representing the outermost tissue of the cylinder, is a layer, and mostly a single one, of thinwalled cells, which is called the pericycle or pericambium (*P.*). The cell walls are never suberized nor do they show any foldings. It is a tissue of great importance, since the lateral roots become developed from this, and usually also the root-shoots.

Inside the pericycle we find the leptome (*L.*) with sieve-tubes and companion-cells, and the hadrome (*H.*) with the vessels. These two elements, the leptome and hadrome, are in the root arranged in separate groups, side by side, alternating with each other in contrast to the stem, where they are located in the same radius, the leptome outside, the hadrome inside. The vessels are of different width in proportion to their age, the narrowest being the earliest developed. The sieve-tubes and their companion-cells are, as already stated, located between the rays of the hadrome, and their delicate structure makes them readily distinguished from the thick-walled vessels and conjunctive tissue, the last of which occupies the centre of the root; it is parenchymatic and corresponds well with the pith of the stems.

This root represents the annual type, and no increase in thickness takes place, thus the root remains unchanged until it dies at the end of the season. But if we now examine perennial roots, we notice that an increase in thickness generally takes place which results in greatly modified structures of which the following is the most frequent and may be considered the normal.

The first sign of change in structure is to be observed in the central cylinder where a cambial tissue becomes formed in the shape of arches and on the inside of the leptome; this cambial tissue thus originates in the conjunctive tissue bordering on the

leptome. The cambium commences then to develop new groups of leptome outwards and new groups of hadrome inwardly. By continued growth the cambial arches extend towards the pericycle and meet outside the rays of the hadrome, thus a completely closed ring of cambium becomes formed, and this is able to develop leptome and hadrome throughout its entire width. The original structure of the root has, thus, become very considerably changed, since the secondary groups of leptome are located in the same radius as the secondary hadrome, while the primary were arranged in alternation with each other. At this stage the structure is very much like that of a stem (Dicotyledones and Gymnosperms) except that the primordial hadromatic rays are yet to be observed. But besides resulting in the formation of secondary leptome and hadrome due to the cell-division of the cambial ring, the pericycle possesses, also, the power of developing secondary tissues by similar cell-divisions. This new tissue is, on the other hand, parenchymatic, and is called the secondary cortex, since it agrees in all respects with this particular tissue. It is easy to understand that the primary cortex with epidermis and endodermis are not able to follow the continued growth of the elements in the central cylinder, but become split, die off and are finally thrown off altogether, thus the secondary cortex formed by the pericycle takes the place of the primary.

We may pass now to the structure of the beet. In a fully developed root of this plant we notice in a cross-section a number of concentric rings, resembling the annual rings of a perennial, woody stem. However, these rings are all made in one summer, and by following their structure gradually from month to month, the structure is shown to have originated in a very different way from that of a stem. The fact is that the secondary cortex is here able to develop continuously new strata of leptome and hadrome separated by medullary rays in concentric rings and in centrifugal direction. As soon as one stratum of leptome and hadrome has performed its function for some time, it ceases to grow any further, and a renewed formation of another ring outside the first one takes place and so on, so that a number of rings are formed during the season ; the most conspicuous portion of each of these

rings is the hadrome, which consists of a few lignified vessels, the only lignified elements of the root. The rings which we thus observe in the beet are not to be compared with the annual of a stem, since they are developed in one season and since they are developed independently of each other, while in the stem the annual rings depend upon the cell-divisions of the same cambium.

Brookland, D.C., January, 1906.

A MAY MORNING WITH THE BIRDS IN NEW BRUNSWICK.

By W. H. MOORE.

The morning was truly delightful. The pulse of Nature was throbbing in ecstacy under the genial rays of old Sol, who had seemingly neglected his charges here upon the earth for some days before. The northward sway of bird migration had been at a standstill for a few days, but upon this morning of May (1905) the wave was fast advancing.

A walk of about a mile was taken through woods and along a highway a short distance across clearings. Birds were plentiful in all places. In trees about the lawn near the house was a number of self-naming birds, namely, Tom-Peabody, known to the scientific world as *Zonotrichia albicollis*. In a thickly grown spruce by the side of the path, a pair of robins were building a nest, and just as I walked past, one came with a great mouthful of grass. In some hazel shrubbery, nearby, were a few song-sparrows, and one Mrs. Peabody, busily engaged searching among the stranded leaves. Among the young foliage of a small yellow birch beside a brook was a redstart flitting and tumbling after various insects, and now and then stopping to sing his song of thanksgiving for being permitted to be alive this beautiful Sunday morning. Among a growth of young conifers, was a Magnolia warbler singing to his mate, who was no doubt thinking what a good locality that would be in which to breed. A black-and-white warbler was a short distance farther along among a mixed growth

of maples, birches and conifers. His presence was first made known by his song of *wee-see, wee-see, wee-see*. Constantly there could be heard the lively, pleasing song of the purple finch, which at this time of year is singing its best. From numerous tall dead trees came the calling and tap-tap-tap, tap-tap-tap-tap of the yellow-bellied sapsucker. The beating tatoo of this species is more interrupted in its course than is the continuous roll of other woodpeckers. Twittering barn swallows were flying high in the air. Farther on a stop was made to write down some notes and take in the songs of one Cape May warbler, three hermit thrushes, four Magnolia warblers, one robin, one white-throated sparrow, three black-throated green warblers, two black-throated blue warblers, two ovenbirds, one junco, one goldfinch, and three Nashville warblers. After a short walk along an old lumber road, a stop is again made, and notes taken of such songs as some of the above, in addition to two Parula warblers, four least flycatchers, two purple martins and the voluminous songs of two winter wrens. As I sit here upon an old stump, the first olive-sided flycatcher of the season alights upon the topmost tower of a birch stub and calls out, *Look, I'm here*, or *Put me down*. The song of the olive-side when heard from a distance easily sounds *Take care*, with emphasis upon the first and last of the two syllables, the first note of *Look, I'm here* is heard only when one is near the bird.

The olive-side was answered by a chebee which had been present for some days and which enthusiastically called out *Go-back* or *Go-beck*. Thus it could be interpreted by the genus Homo, but among the aves it was probably a call of love, while for certain insecta it may have been a warning of danger. Some bird behind me gives a twittering, and, turning about, at length I discover in a tangle of raspberry, small maple sprouts and dead brush, a male Maryland yellow-throat while an olive-back thrush calls attention from another tangle nearby. A small flock of crows fly cawing past, just above the tree-tops, and in the distance is heard the calls of a pileated woodpecker.

As no chickadees had yet been heard, I whistle their love song of sweet weather, and am answered by the same notes from one

of these birds. In returning homeward the Blackburnian warbler is added to the list of birds observed in a walk of a mile. Through the meadow by the rear of the house were numerous chipping, Savanna and vesper sparrows, and a pair each of flicker, bluebird, white-bellied swallow, and several eave or cliff swallows. In a swamp by the edge of the clearing the waterthrush lives.

This was the banner day of the season, as eight new arrivals were recorded. Insects of many species were likewise alert; among numerous blooming plants were identified the white and blue violets, dandelion, goldthread, swamp honeysuckle and moosewood.

Scotch Lake, N.B.

SPERGULA ARVENSIS, L. In *Rhodora* for August, 1905, Mr. M. L. Fernald notes the occurrence of *Spergula sativa*, Boenn., at New London, Conn. When examining the material of *S. arvensis* in the Gray Herbarium he found plants collected by Dr. James Fletcher ot Ottawa in 1892 and distributed in Halsted's American Weeds as *S. arvensis* that are *S. sativa*. I have just examined all the *Spergula* in the herbarium of the Geological Survey and find that the only representatives of *S. sativa* there are from Denmark and Norway, and are so labelled by the collectors. All our other specimens from Canada, the United States and Europe are *S. arvensis*, our Ottawa specimens being from Wakefield and Pickanock. It is possible that in Halsted's distribution he mixed material from some other locality with that received from Dr. Fletcher, but *S. sativa* should be looked for in this vicinity. *S. sativa* "has minutely punctulate, margined seeds, and in a living state can be distinguished by its decidedly viscous, dull grey-green leaves and branches; on the other hand, in *S. vulgaris* (*S. arvensis*) the seeds are obscurely margined, or totally devoid of wing, and beset with club-shaped papillæ, generally quite black in fully matured seeds."

JAS. M. MACOUN.

NATURE STUDY.—No. XXXIII.

DEFINITE PROBLEMS IN NATURE STUDY.

S. B. SINCLAIR, M.A., Ph.D.

HUNTO ISLAND, MUSKOKA, ONT.
Eighteen years of unassisted forest growth.

The following elementary experiment is submitted in the hope that it may be suggestive of others, and also emphasize the fundamental principle that in beginning Nature Study the main difficulty lies in selecting a suitable problem and making a definite and sequential study of the subject chosen.

FOREST DEVELOPMENT.

The island of Hunto in Portage Lake, twenty miles southeast of Parry Sound, Ontario, has an area of about seven acres, and, like other islands of the Muskoka region, is simply the summit of an upheaved mountain of Laurentian granite, the highest point being about 80 feet above the level of the surrounding lake.

About two-thirds of the surface is covered with soil varying from one inch to thirty inches in depth.

In the year 1887, the island, which was then beautifully wooded, was swept by a fire which completely destroyed all vegetation, except a few straggling pines at the water's edge. Those who saw the island during and after the fire, say that the desolation wrought was so complete that it was scarcely possible that any young plants or even seeds could have survived the intense heat. Since that time no new timber has been cut, no domestic animals have been on the island, and with the exception of a few hares, deer-mice and squirrels, there apparently has been nothing to interfere with the development of the smallest herb.

This situation seemed to present a problem which, if worked out, might cast some light upon the kind of vegetation which under similar conditions—of climate, soil, non-interference, etc.—might reasonably be expected to develop in a period of eighteen years, and with a view to the solution of this problem a somewhat careful investigation has been carried on for two consecutive summers.

Altogether there were found on the island forty-seven different varieties of trees and shrubs, and a number of these were evidently new comers. The following is a comparative statement of the height and circumference of a few of the largest trees in 1904 and 1905 :

	1904		1905	
	Height feet.	Circ. inches.	Height feet.	Circ. inches.
Populus tremuloides, American Aspen-Poplar	35	12	37	14
Betula papyrifera, Paper or Canoe Birch	30	19	32	18
Prunus Pennsylvanica, Wild Red Cherry	29	16	30.5	16
Pinus Strobus, White Pine	22	13	24	13
Acer rubrum, Soft Red Maple	22	9	22	13
Quercus rubra, Red Oak, Black Oak	20	14	20	16
Thuya occidentalis, American Arbor-vitæ, White Cedar	20	14	20.6	16
Pinus resinosa, Red Pine	19	11	10.5	13
Larix Americana, American Larch, Tamarack	16	8	17.5	9.5
Quercus alba, White Oak	15	8	16.5	9.5
Abies balsamea, Balsam Fir	13.5	9	15	9.5
Tsuga Canadensis, Hemlock Spruce	11	5	11	8

The time and labor requisite for collecting, identifying and mounting specimens and for measuring trees in such an investigation is not great. Nor is the collection of specimens a necessary condition of satisfactory work. The study of the living organism from the genetic functional standpoint is of much greater value than the mechanical examination of dead specimens. One of the best features of such work is that it presents obstacles which furnish a natural stimulus to endeavor and which when overcome afford genuine satisfaction. Where serious difficulty is presented and individual observation and text-books prove inadequate, the Canadian Government has wisely made provision for all emergencies by providing trained specialists, who are able and willing to answer questions submitted to them and to whom inquiry can be sent postage free. In this connection my best thanks are due to Dr. Fletcher, of the Experimental Farm at Ottawa, who not only supervised the classification made, but also made a personal inspection of the locality studied.

The essential requirement of a university post-graduate dissertation is that it must add something, no matter how little, to the sum total of human knowledge. Measured by this criterion such an investigation as the foregoing, be it ever so limited in scope or unpretentious in character, at once becomes important, for one finds oneself doing that which has been done by no one else, and if the work be honestly performed and the records accurately kept, the information gained (although apparently trivial) may prove to be of genuine public service in future interpretation.

Another of the advantages of such definite research work is that it is adapted to the stage of development reached by the adult learner who, although he has omitted Nature Study in early life, has acquired as the result of natural growth and activity in other studies a scientific attitude of mind which causes him to appreciate the meaning and value of the laboratory method and to prefer it to a more superficial treatment.

The experience of the Ottawa Normal students in the study of birds affords practical illustration of this fact. For a number of years each student has been asked to learn the identification

and general characteristics of sixty species and to make a careful and thorough study of one species as regards life-history, life-relations, care, etc. The invariable opinion expressed by the students is that they find the intensive study more interesting than the more extended observation.

From the standpoint of the learner, the actual knowledge gained is of genuine value, being in a very especial sense his own. It is probable, however, that what may be called the *indirect* results of such an investigation are really of most worth to the student. The attention is sure to be attracted to a thousand interesting phenomena which otherwise would have passed unnoticed. For example, in the foregoing investigation certain kinds of trees were found to be grouped in favorable places in their own special habitats. There was a preponderance of ferns, fungi and mosses on the northern exposure where there was least evaporation, and swamp plants were found in the lowest parts of the island.

Many other interesting phenomena in connection with soil formation, heat and moisture conditions, were similarly incidentally noted.

Further, in such study one is sure to become impressed with the fact that the investigation of sequential life-history is more interesting than the study of a cross-section. "What have we here?" is seldom as productive a question as "How did it get here?" or "Whither does it tend?"

While carrying on the foregoing investigation, such problems as the following naturally suggest themselves: "How were the seeds brought to the island?" "In what order did the trees appear?" "What other trees will come and how will they come?" "Will the struggle for supremacy leave conditions as at present, *e.g.*, will the poplar continue to rule the pine?"

The narrow limits of such a paper will not admit of further reference to the more fascinating and productive studies of structure, function and life-relations. The interest in such work is always cumulative, the Nature Study attitude soon becomes habitual, and after that all is clear sailing.

THE OTTAWA NATURALIST.

VOL. XX. OTTAWA, MAY, 1906. No. 2

LIST OF SOME FRESH-WATER SHELLS FROM NORTH-WESTERN ONTARIO AND KEEWATIN.*

By J. F. WHITEAVES.

(A.) *From the English River, in North-western Ontario above Lac Seul; collected by W. McInnes, of the Geological Survey of Canada, in 1905.*

PELECYPODA.

**Sphærium flavum*, Prime.

English River, below Manitou Fall; one specimen.

GASTEROPODA.

Planorbis (Pierosoma) corpulentus, Say.

English River, below Manitou Fall; three specimens, the largest of which is fully an inch in its maximum diameter. The adult shell of this species, which corresponds to the variety *macrostomus* of *P. trivolvis*, has not yet been described nor figured.

(B.) *From various localities on the boundary between Ontario and Keewatin, or in Keewatin; collected by W. McInnes in 1905.*

PELECYPODA.

Lampsilis luteola (Lamarck).

Albany River, between lakes St. Joseph and Eabemet; five specimens.

* Communicated by permission of the Director of the Geological Survey Department. The species with an asterisk prefixed to their names, have been kindly determined by Dr. V. Sterki.

Anodonta Kennicotti (?) Lea. Var.

Lake St. Joseph, one specimen ; Albany River, two specimens; and West Branch of the Winisk River, two specimens.

**Sphærium flavum*, Prime.

Root River, Lac Seul ; one specimen.

Sphærium rhomboideum (Say).

Lake St. Joseph, two specimens ; and Albany River, three specimens.

**Pisidium variabile*, Prime.

Lake St. Joseph, at two localities, three specimens from each; and Albany River, two specimens.

**Pisidium Mainense*, Sterki.

Root River, nine specimens.

**Pisidium "abditum*, Haldeman."

Albany River, thirteen specimens.

**Pisidium Roperi*, Sterki.

Albany River, five specimens.

**Pisidium politum*, Sterki.

Root River, one specimen.

**Pisidium rotundatum*, Prime.

Lake St. Joseph, one specimen.

**Pisidium pauperculum*, var. *crystallense*, Sterki.

Root River, one specimen.

**Pisidium splendidulum*, Sterki. Var.

Lake St. Joseph, at two localities ; seven specimens.

**Pisidium vesiculare*, Sterki.

Head of Lake St. Joseph, fourteen specimens.

**Pisidium medianum*, Sterki.

Lake St. Joseph, one specimen.

**Pisidium miltum*, Held. Small var.

Head of Lake St. Joseph, one specimen.

GASTEROPODA.

Valvata tricarinata, Say.
Albany River, four specimens.

Valvata sincera, Say.
Lake St. Joseph, at two localities ; four specimens.

Amnicola limosa, Say.
Root River, several specimens.

Limnæa stagnalis, L.
Trout Lake, Severn River, Keewatin ; two specimens.

Limnæa catascopium, Say.
Albany River, six specimens ; and Trout Lake, two specimens.

Planorbis (Helisoma) bicarinatus, Say.
Albany River, one specimen.

Planorbis (Gyraulus) albus, Muller.
Albany River, four specimens ; and West Branch of the Winisk River, seven specimens.

Physa heterostropha, Say.
Albany River, three specimens.

Ancylus parallelus, Haldeman.
Root River, one specimen.

(C.) *From Knee Lake, Keewatin, on the Hayes River route from Norway House to York Factory, in Lat. 55° N., and Long. 95° W.; collected by O. O'Sullivan, of the Geological Survey of Canada, in 1905.*

PELECYPODA.

Sphærium simile (Say);
One adult and perfect specimen.

**Sphærium emarginatum* (?) Prime.
(Or *S. stamineum*, Conrad, var.)
Several specimens.

**Pisidium fallax*, var. *errans*, Sterki.
One specimen.

GASTEROPODA.

Amnicola limosa, Say.
One specimen.

Limnæa stagnalis, L.
Three specimens (two broken in transit).

Limnæa catascopium, Say.
Six specimens.

Planorbis (Helisoma) bicarinatus, Say.
Eight specimens.

Planorbis (Pierosoma) trivolvis, Say.
Three specimens.

Planorbis (Pierosoma) corpulentus, Say.
One large adult specimen (unfortunately broken in transit).

Planorbis (Planorbella) campanulatus, Say.
One specimen.

Planorbis (Menetus) exacutus, Say.
One specimen.

Physa heterostropha, Say.
Two specimens.

Ottawa, April 17, 1906.

EARLY NESTING OF THE VESPER SPARROW.

To-day, May 1st, I found a Vesper Sparrow's nest containing three eggs. I was rather surprised at this find, as these birds very seldom have full sets in this district until about May 24th. The nest was built of grasses and stems, with a heavy lining of horse-hair, and was placed in a clump of dead grass one foot high in a field which was for the most part damp and marshy.

W. J. BROWN

Westmount, Que., May 2, 1906.

THE MIGRATION OF BIRDS*

Rev. C. W. G. EIFRIG, A. O. U.

The natural phenomenon of bird migration must appeal as interesting and mysterious to every thinking person, especially to the lover and observer of nature. But I fear the mysterious part of it must remain so to a greater or lesser extent, even after all that can be, has been said on it. A flood of new light, however, has been shed on this subject recently by the publications of the Biological Survey of the Department of Agriculture at Washington, D. C. This department has for about 20 years been sending out blank question sheets to competent ornithologists all over America, on which are to be noted the names of all the migrant birds passing through certain localities, the first and last dates when seen in spring and fall, etc. I may say also that a member of the Ottawa Field-Naturalists' Club has for many years been sending in these sheets, well filled out, from this section, namely that very competent and indefatigable ornithologist, Mr. George R. White. This vast amount of data and statistics on migration is now being systematically worked over and has already yielded highly interesting and unexpected results, as witness the writings of Prof. Wells W. Cook, of the Biological Survey, Washington. To these I am indebted for many of the statements I am here able to make.

The first question suggesting itself in regard to migration is: *Why* do birds migrate at all? Why do they leave us? Some will answer: "Because it would be too cold for them in winter." That this cannot be the whole reason we can at once see from the fact that the tiny Chickadee, the Snowflake, frequently the Pine Siskin and Redpoll remain with us all winter. Besides, some birds, also their young which never experienced a winter any-

*Lecture delivered before the Ottawa Field-Naturalists' Club, at the Normal School, Ottawa, Jan. 23, 1906.

Since this had not been written out before the lecture, it can not be reproduced in exactly the same form as delivered. There are many but slight omissions and alterations. The greater part of the introduction is also omitted.

where, begin to leave us in August, when there is no sign of cold. And why would they then leave again the warm Southland where there is no cold to be feared at any time? Some will say: "It is because their food gives out in winter." This is, of course, a better reason than the first, though the two are interrelated. But that even the very important food question cannot be the sole motive for their migrating can be seen from the fact, that many birds start away from here in August and early September when their food is most abundant, and the same can probably be said of the places they leave when returning north. So this point is somewhat mysterious. We have to fall back on instinct, which of course, while being a handy word to use, does not explain anything to us. The birds seem to have an instinctive desire for seclusion during their nesting time, which could not be obtained in the south, where the millions of birds from the north are crowded together with the teeming faunal life there resident. This, together with the evident love for the place where they were born, seems to be the motive, at least for the northward migration. Besides, we notice an instinct or impulse for migrating in other animals also, as among the lemmings, the salmon, eel, herring, etc.

Then we ask, "*When* do birds migrate?" No any one answer will suffice for this question. We have a spring migration, the birds travelling northward, and a fall migration, southward. Each extends over a long time, as some species come and go early, others late. There are probably only two months when no migration of any kind or at least wandering and roving about takes place, these being January and June, the latter the nesting month over a large part of the northern hemisphere. With us the beginning is made in the spring migration by the Prairie Horned Lark and the Crow, which come about the last week of February. During the second half of March come the Song Sparrow, Bluebird, Robin, Tree Swallow, etc., in April the Phoebe, Kingfisher, gulls, ducks, blackbirds, Meadowlark, etc., but May is the leading month in the spring migration. Then, huge waves of warblers, finches or sparrows, fly catchers and vireos come. The last migrant here is the Blackpoll Warbler, which can be heard into the first few days of June. The fall migration is started by some

warblers and shore birds as early as July, by more in August, but the bulk of it takes place in September; the number of birds decreasing rapidly during October, and a few bringing up the rear in November.

Now, as to the time of the *day* in which the migrations take place. The rule here seems to be: The weak-winged and timid birds, such as rails and some sandpipers, etc., birds finding their food under cover, as the warblers, some finches, thrushes, vireos, etc., migrate during the *night*, so they can rest during the day and find their food more easily than they could at night. Other birds, strong of wing, fearless, finding their food more in the open, as the blackbirds, the robin, etc., travel partly during the day or night, making use of either or both times to suit their pleasure. A third class, such having long wings, expert tireless fliers, which find their food while flying, as the swift, the swallows, also the gulls, terns, hawks, etc., travel by day exclusively, for apparent reasons.

Over what *distances* do their migrations take the birds? That is again extremely variable. When our Ruffed Grouse (*Bonasa umbellus togata*) leisurely walks from its summer haunts on top of one of the Laurentian hills to the north of us and goes down a mile into the nearest cedar or spruce swamp, that may also be called a migration. The same can be said, when some birds breeding in the Rocky Mountains near the summit or the timber line, leave these *quasi* boreal regions and by descending a mile or two enter the temperate or even subtropical zone. Some of our breeding birds go further, as the Purple Finch, Junco, etc., and winter 2-300 miles south in New York State. From that the distances increase rapidly to as much as 8,000 miles for one trip, as in the case of the Golden Plover, the Knot, the Eskimo Curlew and many more.

Over what *routes* do they travel? As a general rule we may say, that the birds breeding from Labrador and Ungava southward, go to Florida, as their first stage of migration, many species of course wintering north of that. Those breeding west of Hudson Bay and east of the Rocky Mountains in the great Mississippi water shed, go towards and to Louisiana. Those breeding in and west of the Rocky Mountains travel overland entirely into

Mexico. That there are many exceptions to this is evident. Thus, some Alaska birds, instead of joining the western or middle contingent, seem to travel to the east, as the Blackpoll Warbler ; and the Bobolink, which has advanced from its eastern habitat as far west as Utah, has been shown to travel back east in migration, over the way its species originally extended its range westward, instead of going the shorter way by land into Mexico ; thus adhering to family traditions. The same is done by the Wheatear, a European species, having come by way of Iceland and Greenland to Labrador, now breeding there. That migrates back to Europe over the same route the species has come. Now, how do those that want to go further south proceed from the Gulf coast? Not as we might suppose via the Greater and Lesser Antilles to South America, that being to our mind the easiest route ; they would always be in sight of land, near food, etc. Of about 25 species which make a start over this route, only about six finish it to the South American main. Nor do a great many take another apparently easy route, *i.e.* from southern Florida to Cuba, on that island to its western point and then by a short flight of about 100 miles to Yucatan. No, one main route is from Florida to Cuba, thence to Jamaica, at both of which many species remain, and thence by a 500 mile flight over the Carribean Sea to South America. Another route is from northwestern Florida straight south to South or Central America or Yucatan. Another from Louisiana south and south-west to Mexico. These routes also seem to show that the birds cannot, as a rule, be greatly exhausted by long flights, otherwise they would dread them and rather make use of all the islands they could and travel from Louisana, or at least from Texas by land into Mexico, which most birds scorn to do, thereby not even cutting off much distance or time. It has also been discovered by these late investigations, that some species coming north from Mexico, etc., do not alight as soon as they have land under them, but rather fly many miles inland before doing so.

An interesting question in connection with migration always has been, "*How do the birds find their way?*" It has been held that the configuration of the land below, the physical features of it, play an important role in this. That this can be true only to a slight extent, we can at once see, when we bear in mind tha

many birds migrate at night, some high up; that the young birds going the first time can have no knowledge and experience of the route; when they leave here in September the trees are yet full of leaves and the fields not empty, whereas the landscape looks entirely different in April or May, when no leaves are out and the fields are bare, etc. Some seem to follow the coast line or the rivers, especially day migrants, but this can not explain all. The solution of the problem seems to be, that they have *a sense of direction*, and their instinct—whatever that is—seems to impel them in the right, usually for them best direction. That they must have such a sense, we can see from the Carrier or Homing Pigeon. This may be put into a box, taken aboard a train and carried on it hundreds of miles to a place where it never has been, neither can it see the physical features of the way, yet on being liberated it will find its way back with most unerring directness.

At what *height* do the birds travel during migration? A balloonist has seen an eagle soaring about at a height of 9,000 ft. —which does not say it was migrating. Some observers have seen large bands of migrants at an altitude of 5,000 ft. An experimenter with kites has seen large migrations of ducks at from 1,300 to 1,500 ft. high. Many birds are killed by flying against lighthouses no more than 100 ft. high. So, no one answer can be given to this question. Some species always, and others perhaps only when the air is heavy and foggy, fly very low, not more than perhaps 100 ft. over all trees and houses. We can hear their voices plainly at night during migration. But the bulk of it seems to be going on at a *height of from 500 to 1,500 ft.* They want to stay below the lowest clouds. That they are sometimes bewildered and driven out of their course by fog and strong winds is equally certain.

At *what rate of speed* do the birds proceed southward and northward? That this must be very variable we can see at once when we look at the wings of the warbler, thrush or rail and at those of the swallows, gulls and hawks. If we divide the distances travelled by the number of days spent in migration, we obtain a rate of from about *25 to 150 miles a day.* This does, of course, not mean, that the birds get up into the air, fly straight ahead for a day and then are only so much farther on than the day before.

No, they can fly that fast and faster in an hour and probably do that at times, especially when crossing large bodies of water. It simply means that by either one long or several short flights interrupted by leisurely feeding in between, they proceed so far in a day. They take it very easy during the first days or weeks of their journey, accelerating the speed towards the end. That the relative position of the masses of birds, also those of one species, breeding at the various latitudes, is much changed and shifted, owing to difference in speed, can easily be imagined, also that the migrants of a southerly species may be overtaken and passed by more northerly ones. Thus the southern form of Maryland Yellowthoat is passed and left behind by its more northerly congeners.

That many casualties may occur during migration, that disaster overtakes single birds as well as whole flights, is not to be wondered at. When the air is heavy and full of fog the birds fly very low and then strike high objects, steeples and especially lighthouses. Prof. W. W. Cooke notes that one morning in May 150 dead birds were picked up at the foot of Washington Monument, 555 feet high. When the light on the Statue of Liberty in New York harbor was still burning, 700 dead birds a month was the usual crop of fatalities during migration, as reported by Chapman. Some time ago an item of news was making the round of the papers, that on two mornings during the last fall migration 6,000 birds had been killed against a lighthouse on the north coast of France Even if there were only 600 it was bad enough. Or when birds flying northward, say over the Gulf of Mexico or Lake Erie, are met by a fierce gale from the north, that then hundreds, if not thousands are occasionally hurled into a watery grave, can well be understood, especially of the weaker-winged species. That some of the hawks reap a rich harvest during migration, especially the little Sharpshinned, Cooper's, Duck and Goshawk is also clear.

Now, as to some anomalies and curiosities of migration. Some of our hardy Canadian birds perform, instead of a migration in the accepted sense, a series of apparently aimless, eccentric rovings and wanderings, not only southward, but in various directions and without all regularity. Thus the Pine Grosbeak and

Bohemian Waxwing may be present at a place in one winter and then not be seen again there for years. This case is more mysterious than the others. The same holds good of the Canada Jay, the various redpolls and the Pine Siskin, though in a lesser degree. Then there are the herons, which before starting south in fall from their breeding places, seem to go on a little excursion northward first, and are sometimes taken far north of their range. The extraordinary route of the Golden Plover (*Charadrius dominicus*) and several more shore birds should here be noted. These birds breed in the bleak lands near and beyond the Arctic circle. In August, when the young are able to fly well, they proceed from north-central Canada to Labrador, thence by easy stages to Nova Scotia, etc., from there south over the Atlantic Ocean, to the Bahamas, to South America, through Brazil, still south through Argentine to Patagonia, 8,000 miles. After a short stay in that dreary place, they proceed northward again, but by a different route, further west in South America, through Central America, into the wide Mississippi valley, and in that north to their breeding place, near the Arctic circle, 16,000 miles in all.

There are several other birds which go from and back to their breeding range by different routes. Thus I found the rare Cape May Warbler common in fall in western Maryland, but none in the spring. Another curious fact brought to light by the data accumuluting at Washington is the case of the Nashville Warbler. This breeds here and northward and proceeds in fall southward with other warblers, travelling by easy stages, feeding in day time along the way, like any other well-behaved warbler would. But south of the southern boundary of Virginia it is practically unknown, only turning up again in its winter range, Mexico, near Vera Cruz. The only inference left seems to be, that it rises up high into the air at about the latitude of Virginia and flies without alighting again over all the intervening land and the Gulf. Who knows? The well known and abundant Chimney Swift offers another mystery. It moves southward in fall, its flocks becoming enormously large when they reach the Gulf coast. Then they disappear as though the Gulf had swallowed them, until they turn up again next March bright and cheerful as ever. Where they spent the winter months is a complete mystery so far, and the world is

rather thoroughly explored ornithologically, at least as far as large masses of birds are concerned. Nor are these the only unknown things in migration.

So we see that in spite of the large mass of data and statistics at hand, and the multitude of workers and observers, there is still much to be learned and better understood in that fascinating natural phenomenon: the migration of birds.

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The "Auk"; my own notes.

BIRD NOTES.

PRAIRIE HORNED LARKS.—We first saw the Prairie Horned larks this year on March 4th, and as the season advanced they appeared to become more numerous. On April 1st, while walking across the country on Isle Jesus, we were surprised by seeing a lark flying about our heads. As the open country was practically bare of snow, we thought it not unlikely that the bird had a nest nearby. About 50 or 60 feet away we found the nest, which was snugly placed near a stone. The nest contained no eggs. On the same day we located another nest of this species on a hillside nearby, which was also empty.

On April 8th we visited these nests again, and they both contained full sets—four eggs in each. Later in the day we were successful in finding three other nests, two of which contained four eggs each and the other was just about ready for eggs.

All of these nests were placed in "bald-headed" fields, *i.e.*, in pastures where the dead grass was only about an inch high and was entirely free of weeds, etc. In the majority of cases the birds could not be seen when the nests were found. The young birds had begun to form in the eggs of two of the sets.

W. J. BROWN.

Westmount, Que., April 9, 1906.

THE OTTAWA SPECIES OF ERIOPHORUM.

Mr. M. L. Fernald's revision of the genus Eriphorum* has made some changes necessary in the names of the species growing in the vicinity of Ottawa. It is probable that one or two additional species or varieties may be found here and that collectors may know what species have been already recorded the following notes are published. The localities mentioned are those known to the writer. The numbers and collector' names are those on the sheets in the herbarium of the Geological Survey.

ERIOPHORUM CHAMISSONIS, C. A. Meyer.

E. russeolum, Fries.

Very abundant at the Mer Bleue, near Eastman's Springs, Ont., No. 11,496. (*John Macoun.*)

ERIOPHORUM CALLITRIX, Chamisso.

E. vaginatum of local botanists.

Casselman, Ont., No. 10,302. (*John Macoun.*) Blackburn Station, Ont., near the Mer Bleue, No. 61,191. (*John Macoun.*) Also noted by Prof. Macoun in a bog near East Templeton, Que., and in a bog by Strachan's Lake, east of Cascadé, Que.

ERIOPHORUM GRACILE, Koch.

In meadows and peat bogs by McKay's Lake, at Dow's Swamp and Mer Bleue. Dow's Swamp, Nos. 32,240 and 61,193; Mer Bleue near Eastman's Springs, Ont., No. 11,495. (*John Macoun*)

ERIOPHORUM VIRIDI-CARINATUM, (Engelm.) Fernald.

This species or *E. polystachion* is to be found in many bogs and boggy meadows around Ottawa, but our two herbarium sheets are both *E. viridi-carinatum*, Casselman, Ont., Nos. 32,267 and 61,152; in a swamp half a mile north of Tetreauville, Que. (*John Macoun.*)

* Rhodora, Vol. VII, pp 81-92.

ERIOPHORUM VIRGINICUM, L.

Rather rare around Ottawa; known from the Mer Bleue, Strachan Lake and East Templeton and formerly at the old race course. Boggy place, The Glebe, Ottawa, Ont., No. 7,573; Strachan Lake near Cascade, Que., No. 61,190. (*John Macoun.*)

The species to be looked for about Ottawa are *E. polystachion*, which is doubtless common in this vicinity though not represented in our herbarium, *E. tenellum* and *E. opacum*. The general characters of these three species and their nearest relatives, *E. viridi-carinatum*, *E. Callitrix* and *E. gracile* as indicated by Mr. Fernald are given below.

E. POLYSTACHION. Midrib of the scale prominent only below the membraneous tip; leaves triangular-channelled above the middle; the upper sheaths dark girdled at the summit.

E. VIRIDI-CARINATUM. Midrib of the scale prominent, extending to the tip; leaves flat, except at the very tip; the sheaths and bracts not dark-girdled.

E. CALLITRIX. Upper sheaths distinctly inflated: culm trigonous and (under lens) scabrous at tip; pits of the receptacle with obtusely angled lower walls.

E. OPACUM. Upper sheaths close or scarcely inflated: culm terete, glabrous at tip; pits of the receptacle with rounded lower walls.

E. GRACILE. Upper cauline leaf with the sheath longer than the blade.

E. TENELLUM. Upper cauline leaf with the sheath shorter than the blade.

Scirpus Trichophorum, Aschers & Crœbn. (*E. alpinum*, L.) has been found in several localities near Ottawa.

JAS. M. MACOUN.

SUB-EXCURSION TO BLUEBERRY POINT.

John Burroughs says in one of his delightful little books that April is a good month to be born in, or to make any initiatory step, in fact. It gives you a good start, he says. Certainly the Field-Naturalists felt on assembling at Blueberry Point, Aylmer, on the afternoon of April 28th that an excellent start had been made.

It was the first outing of the season, unfavourable weather having cancelled previous arrangements for a trip to Rockliffe. Almost 150 persons met at Blueberry Point, however, on the 28th, when the weather conditions were ideal Some of the leaders of the various departments being absent the field-body resolved itself into very informal groups and devoted the afternoon mainly to gathering the trailing arbutus and hepatica. The latter in the blue, pink and white varieties, was found on every side dotting the brown sides of hillocks; the arbutus, although not properly in bloom, concealed many fragrant buds for the more patient seekers.

The unusually mild weather prevailing during the past winter, while probably quite acceptable to the majority of people, has had the effect of limiting swampy areas this spring, almost banishing the elusive salamander and other things that creep or scuttle about in lone lands—and so greatly disappointing the members interested in zoology.

The club members reassembling about five o'clock, the president, Mr. W. J. Wilson, having congratulated the club upon the successful nature of its first outing, asked Mr. Andrew Halkett to address the assemblage. A very informing talk was then given by Mr. Halkett who had in spite of adverse conditions secured a number of specimens, including the larva of mosquitoes, a wood-frog, contributed by Mr. Lemieux, water spiders, a centipede, beetles and ants. The lower animal life was shown to be very busily occupied preparing for the fuller life of the summer months.

Mr A. MacNeill imparted then in a pleasantly original manner some subjects for thought, and touched happily upon the basic principle of the Naturalists' outings—the aim to come directly in touch with Nature in her manifold fascinating forms instead of

viewing her abstractedly, if learnedly, through books beset with sonorous scientific nomenclature.

Dr. Sinclair, in speaking of the arbutus seen on all sides, referred to the desire expressed from time to time that it be adapted as Canada's floral emblem. Its characteristics of fine fragrance, and beauty combined with hardy endurance, he described as particularly appropriate in a prospective emblem for the Dominion. The idea again presented seemed to win the entire approval of this particular assemblage of Canadians, as it did years ago that of the inhabitants of the Maritime Provinces. These already recognize as their emblem the little flower which bravely pushes aside the winter's snow to free its bloom, and which called forth from the Hon. Joseph Howe a memorable poem as a tribute.

K. H.

REVIEW.

MOSSES WITH A HAND-LENS. A NEW NATURE STUDY BOOK. 2ND EDITION INCLUDING THE HEPATICS. By A. J. Grout, Ph.D. 150 pages, 33 full page plates and over 150 cuts in the text. $1.50 postpaid. Published by the author at 360 Lenox Road, Brooklyn, N.Y.

Such a book as this has long been needed by the amateur botanist. Specialists have more complete and pretentious works to aid them in their studies of mosses and liverworts, but a good non-technical book that will enable beginners to determine the common species of their neighborhood has long been needed. Prof. Grout's book supplies this need. It is non-technical but is written by a specialist. Its use will enable the Nature Study teacher to widely extend the scope of his work as mosses may be found in the woods even during the winter months, and many species lose little in color and general appearance if gathered in the autumn and stored in closet or cellar until wanted for study in the school-room. The descriptions are easily understood even by a beginner, and the illustrations are excellent reproductions of photographs or accurate drawings.

NATURE STUDY—No. XXXIV.

A CEMENT SIDEWALK.

By S. B. McCREADY, B.A., Professor of Nature Study, McDonald Institute, Guelph, Ontario.

In glancing over the topics that have been dealt with in this series of Nature Study articles in THE OTTAWA NATURALIST I find that more than half of them have been of a general pedagogical treatment, while twelve have been practical studies in plants, insects, birds, rocks and school gardens.

It is to be noted that this series portrays in a general way the history of the adoption of Nature Study in our school courses At first, concern was about the need, the treatment, the courses, the practical value or the pedagogical value of it; latterly the tendency is towards practical, helpful directions for the teachers who have to work at the subject in our common schools. Nature Study stands to-day, with our progressive teachers, accepted as the leavening that will bring large vitality to worn out methods and subjects; what they are asking is for guidance to the recognition and the proper using of the materials,

With the purpose of emphasizing the proposition that the study is not limited in its field to biological or geological things, an outline of a lesson we had with our summer class is here submitted and worked out. A sidewalk had been in process of building for several days. No one had paid much attention to the work, the workmen or the process. This was, in part, owing to a multitude of other interests—chiefly biological—and, in part, to an unconcern that familiarity had bred.

When, however, attention was drawn to the subject, many propositions were opened up for investigating; the investigation was made by daily observation and inquiry. An engineer's work had been done in staking out the walk and making it level—the stakes were driven firmly in the ground and the top level marked with notches or nails. The top soil had been removed until a firm, gravelly bottom was reached; for most of the length of the trench a depth of a foot had been sufficient but where the ground was springy a greater depth was excavated. Into this trench, coarse gravel and broken brick was dumped and packed down. A plank

curb or mould to allow for a four foot walk was set firmly on this foundation · it was built high enough to hold four inches of cement composition.

The work itself well exemplified the principle of division of labor ; each man had his own particular part to play. There were ten men in the gang ; the foreman had a general oversight of all the work and workmen, and shared in the labor when opportunity or necessity arose ; wagons were employed in hauling gravel or sand from pits on the farm and also the cement from the railway car.

The first layer was a "grout" three inches in thickness. It was composed of one part of cement and eight parts of good clear sandy gravel. The largest stones permitted was of about a two inch diameter. Measurement of the proportions was not made with exactness but estimated in wheelbarrow loads. A layer of the gravel was spread on a "mixing-board" with a layer of cement over it, and a large pile built up in this way. Four men then shovelled it back and forth until it was thoroughly mixed. Preparatory to adding the water, it was shovelled into a large concave ring. Sufficient water was added so that after it was well mixed in the wet state, a handful would retain its form after squeezing. It was now shovelled into the moulds and packed firmly. It was not however allowed to lie in one continuous mass ; a large bladed knife was used for making a one-half inch cut every five feet, and this was filled with clear sand.

In the meantime, another cement mixture was being made on another "mixing-board". It was made of one part cement and two parts of clean gritty sand, and after complete mixing and proper wetting was quickly thrown in the mould to the depth of one inch, spread, packed, levelled off with a "straight-edge" and "floated" or smoothed with a wooden "float", a tool like a steel trowel in form. As a precaution against heaving by frost an indentation was made by means of a "divider" every five feet and immediately over the corresponding cut in the grout layer. This completed the sidewalk building, but in order to protect it against too rapidly drying it was covered with canvas for a few days.

The cement cost about $1.85 a barrel at the mill. Freight and cartage were added to this cost. It was all shipped in bags,

as it was for immediate use; the bags weighed ninety pounds and four of them constitute a barrel. Some of the gravel was hauled by men who received $3.50 a day for themselves and teams; being near the pit, eleven loads were hauled in a day's work; where the road was good and the haul out of the pit not difficult, a wagon box of one and one-half cubic yards' capacity was used. An estimate of the cost is made at a rate of 12 cents a square foot, although this particular walk however was built by day labor.

285½	ft. length of	4 ft.	walk	=	1,142 sq. ft.
17½	"	9$\frac{10}{12}$	"	=	229$\frac{4}{8}$ "
10	"	6½	"	=	65 "
				Total,	1,436$\frac{4}{8}$ sq.ft. at 12 c. = $172·37¼.

These measurements were made with a tape line; by "stepping-off" the length, and averaging one's pace, a close approximation of the actual cost was reached.

We afterwards secured some of the cement and examined for fineness, alkalinity, effect on skin, etc. Tests were made, too, of the strength of mixtures of different proportions. Some successful object and map modelling was done with it by some of the students. And in this connection it might be suggested that its use is so simple that some repair work on broken walls might be instituted in some schools as a legitimate Nature Study lesson on cement.

A word on the chemical constitution and action of Portland cement might be of interest and use. In general terms it is a combination of lime (CaO), silica (SiO_2), alumina (Al_2O_3). The lime is furnished by marl and the other two by clay. For good setting qualities certain proportions are essential: 55 to 65 % lime; 22 to 25 % silica; 7 % alumina. Sufficient and no excess of lime to combine with the other ingredients is the desideratum. Water permits the union and crystallization. In a simple form of equation it might be represented thus:

Base.		*Acid.*		*Salt.*
CaO (Lime)	+	SiO_2 (Silica)	=	$CaSiO_3$ (Calcium Silicate).
CaO (Lime)	+	Al_2O_3 (Alumina)	=	$CaAl_2O_4$ (Calcium Aluminate).

So that the artificial stone substance is a mixture of calcium, silicate and aluminate.

In the last report of the Bureau of Mines, part I, recently published by the Department of Lands and Mines of Ontario, there is a very complete account by Mr. P. Gillespie of the cement industry in this province. Some facts are here included from that report, not for the purpose of informing teachers of matters to be retailed to children, but rather to awaken interest in this line of

industry to the end that closer observation may be obtained in an increasing important method of building, which is one of the features of modern life. The report would make a valuable addition to any school library. Senior scholars, especially, would be interested in its accounts of the mineral and agricultural possibilities of New Ontario; they would also learn of the care taken by our Governments to furnish accurate information concerning our resources. Supplementing this, some of the classes might be directed to write, under the name of an appointed secretary, on some industrial or scientific matter that has been unanswered in class and which the authorities at Ottawa or Toronto are, as a rule, able and pleased to help in solving.

There are several brands of cement made in Canada as the "Star," "Hercules," "Saugeen," "Imperial," "Monarch," "National," "Giant," "Samson," "Raven," "Sun." The children might be led to observe what brands were being used in their district, and to enquire as to their origin. A cement map of Ontario, or indeed, one showing the cement structures of the locality might be made. And here it might be said the same line of observation and recording might be practiced in regard to agriculture, implements, waggons, buggies, wind-mills, sewing machines, bricks, shingles, graniteware, clocks, tools, etc.

This article has not been written for information, but as suggestive treatment of this or similar industries and employment of men. Many exercises will suggest themselves to one awakened to the "new teaching" that finds exercise for training children's powers of observation, for awakening wholesome sympathies and interest, for inciting to useful manual operations in the common things lying about us. Here are a few:—measuring a waggon box to find capacity; by weighing a cubic foot of gravel, estimate weight of load; consider how cities issue debentures for new sidewalks and how property owners pay for them; incorporating into their arithmetics questions which were *real* arithmetic questions because actually *worked* out by themselves; drawing a map and estimating the cost of any sidewalk, fence, drain or road in which the individual child or the school has an actual interest; drawing the tools used in the operation; getting figures from practical men regarding the area of walk that one barrel will make and making up arithmetic problems for class work; setting a mud foot-scraper in a cement block for school use; making a drinking trough for the birds. Indeed, the trouble to the teacher is in the great number of exercises and interests that arise and claim attention rather than in their fewness. It is in the proper selection of studies, that the Nature Study teacher shows her skill, no less than in her methods of presenting them.

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A SAGACIOUS CROW.

By ASA A. GALLUP.

Every student of nature has observed in animal life acts that showed wonderful sagacity ; but this faculty is more often noticed in mammals than birds, probably owing to the number of domesticated animals about us, and in birds it may be considered a rarer quality. It must have appeared, however, to anyone who has watched crows congregating and heard the many noises they make that the strange calls and harsh sounds were crow language, and that they had a large vocabulary. The actions of the common American Crow which I relate here were observed this year, and, at least, show remarkable sagacity.

In the latter part of April two crows began housekeeping on Parliament Hill, and built their home about twenty feet from the ground in a cedar tree half way between the brow of the hill and the river. By the third week in May five little crows occupied the home, and at any part of the day five red-lined mouths could be seen wide open to receive whatever food the parents might bring. The mother was always on guard, and at the slightest noise would sit on the nest and cover the young ; but the father apparently spent most of his time during the day away from home. On one of these occasions I happened to be standing on the walk, which runs around the side of the hill, a short distance from the nest, observing some warblers, when I saw the crow alight on a large rock about twenty yards below me. He seemed to have his eyes fixed on some object on the ground farther down the hill, for notwithstanding the repeated attacks of two grackles he held his position. On the departure of his tormentors he shuffled down off the rock and over to the object he had been watching, which was lying among the stones, and began pecking it. After several hard

knocks requiring more than ordinary exertion he broke off a piece and apparently had some difficulty in swallowing it, but in spite of his best efforts, which appeared to be directed in getting a smaller piece than the first, he was unable to get a second mouthful ; and I wondered what he would then do. Without any hesitation, however, he took the object and flew a short distance to where some water trickled over the stones, and as he came nearer to me I saw that he had a biscuit, probably hardtack, or part of a lunch some person had thrown down the hill. He was then partly hidden from view by a projecting rock, and quietly moving along the walk to where I had full view of him I was astonished to see that he was standing in the water holding the biscuit under water with one foot and patiently waiting for it to soak. In a short time his biscuit was partly softened, and beginning around the edge he ate the softer parts. Thus he continued, and finished his meal with no other discomfort than wet feet. The last piece of biscuit he took in his bill broke into several pieces and fell into the water, but he did not lose any of it. Then looking around to see that he had taken all, he quietly flew towards his nest.

This observation was made with the aid of a strong field glass that brought the bird into such clear view that I could almost count the primaries in his wings, and when he came nearer to eat the biscuit I could see the water drop from his bill at each mouthful.

A.

TO THE EDITOR OF THE OTTAWA NATURALIST.

Whilst engaged in some Fisheries matters in the month of month of May, 1903, I found some specimens of the American Smelt (*Osmerus mordax*) floating dead on the surface of the water of Lac des Isles, in the Gatineau District, P.Q. It is known that this species of fish exists land-locked in fresh water-lakes in New Brunswick, Nova Scotia, and in the State of Maine, but its occurrence in a lake so far away from the sea as Lac des Isles, is perhaps worthy of mention. The specimens are dwarfed and perhaps may be regarded as a sub-species : otherwise the external characters appear to agree with the ordinary form of *Orsmerus mordax*.

A. H.

THE CHAMBORD METEORITE.*

Some time during the season of 1904, a mass of iron was picked up in a field about two miles from the village of Chambord, (latitude 48° 35' N. ; longitude 73° 8' W.) county of Lake St. John, province of Quebec. It was secured by Mr. J. Obalski, Superintendent of Mines, Quebec, and by him kindly loaned to the Geological Survey Department for purposes of examination. It is an irregularly shaped block having a length of 18.9 cm., a thickness of about 8.9 cm., and a width varying from 10.1 cm. to 15.5 cm., and a weight of about 6.6 kilogrammes. The surface of the specimen has unfortunately to a considerable extent been marred by chisel and hammer marks made in attempts to cut up the iron. The greater portion of the original crust has been scaled off by prolonged weathering and its place taken by a thin coating of dark brown rust ; that portion of the crust which is still remaining is smooth with a dull enamel-like lustre and has brownish-black colour ; the surface is possessed of the usual pittings found on meteoric irons ; some of these are broad and shallow while others again are small. A trough-like depression extends along one side of the specimen, the bed of which is more or less jagged as if a piece had been detached during the meteorite's flight through the atmosphere. Over a considerable area of the specimen a natural etching is visible, sometimes as coarse furrowings and at others as minute ridges. Etching of a polished surface develops the Widmannstatten figures in moderately coarse outline, the general design indicating an octahedral structure ; this iron therefore belongs to the "Medium Octahedrites" (Om) of Brezina's system of classification. Schreibersite appears in considerable abundance as very thin lamellae disposed between the kamacite plates : in the trough-like depression previously referred to two small nodules of of troilite are exposed in section ; they measure approximately 13 mm. in diameter and exhibit a series of fine parting lines running in parallel position. This iron has not yet been subjected to chemical analysis.

R. A. A. JOHNSTON.

Ottawa, May 19th, 1906.

*Published by permission of the Director of the Geological Survey.

NOTES ON THE EGGS OF THE SOLITARY SANDPIPER.

The solitary sandpiper (*Heledromus solitarius*) is a fairly common Albertan bird not seen much in summer, but abundant during the fall migration. They appear from their retired haunts during the first week in August, when they are found in ones or twos at almost every wet place of any size; that is, in the western parts of the prairie. The variety found is "Cinnamon." The only record I have of the eastern variety is, curious to relate, the ones from which eggs were obtained, at the same time it held the record of being the furthest western point where I have seen the birds, it being some seven or eight miles into the timber (Range 5). We departed to Fallen Timber Creek in quest of fish as also bush butterflies, chiefly *Erebia disa* and *Chionobas Macounii*, camping on Fallen Timber Creek. The next day my friend, Mr. Broughton, enquired where to find certain Graptæ, and decided to go down stream about a mile. Returning to camp for dinner he told me of having found a nest in a small spruce tree; the bird he believed to be a sandpiper. After dinner we both took the gun and returned to the nest. The bird sat very close, in fact did not fly until I put out my hand to catch her. She flew some twenty-five yards, but was shot. The nest contained three eggs and was undoubtedly an old one of a Bohemian waxwing, bent down on one side, in a spruce tree about 12 feet high; nest about 4½ feet off ground. Location, a horseshoe slough, watered by springs flowing out very slowly into the river. Nest tree, 10 feet from the mouth of river. North and south side spruce; northeast, poplar; east, willows. Two days later a set of Bohemian waxwing's eggs were taken in the same spruce.

The eggs, size 1½ x 1 inch, are pale green ground color, sparingly spotted with lilac, but heavier with brown in shades, and are of the usual pointed type. The spots all over, though chiefly at the larger end. Data, 5, vi. 06. One-third fairly hard set. ♀ obtained Fallen Timber Creek, Alta.

NOTE.—The male obtained another mate and I think bred again at that slough, anyway stayed there all summer.

Didsbury, Alta. P. GARRETT.

NESTING OF WILSON'S SNIPE.

On the 17th of May, 1905, as I was passing through a patch of low ground overgrown with second-growth willows, a rather large-sized bird flushed from a spot a few feet from where I had jumped over a neck of water. I did not see the exact place from which the bird had flown, but the fluttering sound of her wing caught my ear, and looking ahead I saw the creature, who with outspread tail and wings, was fluttering on the damp earth, and with her long bill down in the mud was giving vent to a series of squeaking sounds. I knew at once that this bird had flushed from a nest, and that the object of her actions was to draw my attention from something that she was very desirous to conceal; but a little research revealed a nest containing four beautiful eggs. These were of a glossy yellow or olive hue, heavily blotched on the larger end, and marked all over the surface with varying spots of brownish-black; and, as I afterward noted, were about one-third incubated. In size they were about one and a half inches in length by one and one-tenth broad. A clump of willows a little elevated stood about six feet from the pool over which the bird had flown, and midway between the water and the willows, which overhung it, the nest was placed. This was simply a slight depression made by the bird in the moss and dry grass, and except from its concealed situation and being a little more expanded, there was no particular distinction between it and those of the more familiar killdeer plover and spotted sandpiper, though the lining was probably of a warmer texture, being of fine dry grass, while the eggs, as in the case of all the ground-nesting waders, were arranged with the small ends inward. At that time I was not aware that "the snipe," of which there is but one species to be found in Ontario, had become a summer resident of our neighborhood; and as there were reasons for believing that the woodcock nested here, I did not pay the attention to the fluttering bird across the pool that the case required, and so made the serious mistake that the nest and eggs before me were those of the latter bird. On comparing those eggs with a specimen of the egg of the woodcock I saw at once that there was a wide difference—not, however, so much in size or form as in color and

marking, but as I had received other specimens illustrative of oology, purporting to be those of certain species which afterwards proved not to be correct, I concluded, for the time, that such was also the case in this instance, and that my new-found set of eggs were those of the woodcock. So the matter remained until the close of the year when my esteemed ornithological friend, Mr. W. E. Saunders, of London, made me a welcome visit, and on looking over my oological collection I drew his attention to the first and only set of "woodcock's" eggs that I had ever collected. Mr. Saunders at once denied the identification; a dispute followed, and while I admitted that I might be mistaken, yet I was certain that the specimens in question if not those of the woodcock were those of Wilson's snipe. This identification Mr. Saunders also disputed, stating that he had in his collection specimens of the eggs of the European snipe, which he understood were similar to those of Wilson's and that there was a wide difference between the appearance of "his" specimens and those under review; so, in order to settle the question at issue Mr. Saunders kindly undertook to send one of the eggs to the authorities of the Smithsonian Institute at Washington and have the specimen properly identified. The following note from Mr. Saunders, under date of Feb. 28, 1906, tells the sequel. "I have received the egg back from the Washington people, and return it to you by this mail. They say that it is the egg of the European snipe, which, of course, means Wilson's when taken in Canada. I have eggs supposed to be those of the European snipe myself, which are nothing like those at all, but I have no doubt their identification is correct."

Of the nesting habits of *Gallinago delicta* but little of a reliable character is yet known. When Mr. McIlwraith published the second edition of his "Birds of Ontario," in 1894, he wrote of this bird as "a species known only as a spring and fall migrant in southern Ontario," and of its nesting habits he had only vague reports; and from a reference to what little was known about it, in eastern Canada, he springs almost at a bound to some intimations of its existence in almost unexplored regions of Alaska. In the more recent and extensive "Catalogue of Canadian Birds" there are indications that the life-habits and distribu-

tion of this species is becoming better known, and there are various reports that it was found to nest in different parts of Ontario, as well as in the other provinces of the Dominion, yet no ornithologist of Ontario comes forward to actually state that he had seen a nest or taken a set of the eggs of this species within the boundaries of this province; so it is here claimed that the above observations are the first actual record of the finding of the nest of Wilson's snipe in southern Ontario. This game bird is called Wilson's snipe because Alex. Wilson, the distinguished British-American ornithologist, was among the first to direct attention to the difference between it and its European congener. Regarding it he says: "This bird is well known to our sportsmen; and, if not the same, has a very near resemblance to the common snipe of Europe. It is usually known by the name of the English snipe to distinguish it from the woodcock and from several others of the same genus." Up to the past spring season of 1905, I had noted this bird only as a spring and autumn visitor, but it is probable that in the last few years when seen in small flocks I have confounded it with the woodcock.

WM. L. KELLS.

CHRYSANTHEMUM LEUCANTHEMUM, L.—The the typical Ox-eye Daisy appears to be confined to the Atlantic and Pacific coasts, at least as represented in the herbarium of the Geological Survey, all our specimens from the interior, including several from Ottawa, being the var. *subpinnatifidum*, Fenald. The species should be looked for at Ottawa and is easily distinguished from the variety by its basal leaves alone. In *C. Leucanthemum* these are "spatulate-obovate, on slender elongate petioles, the blades crenate-dentate, the slightly broadened petiole-bases rarely fimbiate. In var. *sub-pinnatifidum* the basal leaves are "coarsely and irregularly toothed or lobed, often with the petioles fimbriate at base." The cauline leaves of the variety are much narrower than in the species.

J. M. M.

ZOOLOGICAL REPORT—1905-6.

As a result of the year's work the leaders of the Zoological Branch have the following subjects of interest to lay before the members of the Club.

Two meetings were held during the early part of the season, the first at the residence of Mr. Halkett, the second at that of Prof. Prince. At the first meeting, held on 9th May, 1905, besides the chairman there were present Prof. Prince and Messrs. Lemieux, Campbell and Baldwin. Mr. Campbell, of the Collegiate Institute, exhibited specimens of a salamander in various stages of development. Mr. Halkett followed, shewing prepared specimens of the cranium of Menobranchus or the mud-puppy (*Nocturus maculosus*), and illustrated the comparative structure of the cranium of certain fishes by shewing specimens of that of the angler (*Lophius piscatorius*), the pollock(*Pollachius virens*), the catfish (*Ameiurus nebulosus*) and the yellow perch (*Perca flavescens*). Mr. Baldwin spoke of having seen a black snake (*Zamenis constrictor*) killed with a stone, some ten years ago, from the wounded place of which little young snakes made their exit—thus drawing attention to the apparent viviparous nature of that serpent. Mr. Lemieux shewed photographs of certain mammals, such as the black bear (*Ursus americanus*) and the red deer (*Cariacus virginianus*). Prof. Prince concluded the meeting by reading a paper on the function of the swim-bladder of fishes, of which the following is the substance.

None of the various views generally held, the professor pointed out, regarding the function of the swim-bladder of fishes appears to be perfectly satisfactory. According to these views the swim-bladder is supposed to aid in flotation, giving buoyancy to the fish possessing it, or it acts as a barometer informing the fish as to the pressure of the surrounding water, while it is also regarded as a resounding organ, in connection with the production of sounds, or again respiratory functions have been attributed to it. In some fishes it has connection with the ears by specially modified bones (the Weberian apparatus), and may aid in audition. Professor Prince stated that the following difficulties in accepting these views existed, viz. :—The most buoyant fishes, such as

sharks, mackerel, etc., do not possess a swim bladder, hence it is not essential for flotation. Fresh-water suckers, cat-fishes, etc., have a swim-bladder, and are not exceptionally buoyant. If it is a barometer, why do so many species not possess it, while if it is of use in some cases in connection with voice, it must be noted that most fishes possessing a swim-bladder are voiceless, and again as an aid in hearing, it is no doubt of utility in rare cases, but such is not its common purpose. The features of the organ in young larval fishes indicate a glandular character and it may be a survival of a gland attached to the digestive system, whose utility has gone. In most cases pure aerated blood supplies the swim-bladder, and it cannot be respiratory excepting in rare instances, and being dorsal it is difficult to see how it can be homologous, as many authorities claim, with the ventrally placed lungs of higher vertebrates. Professor Prince also stated that while oxygen was often found in the swim-bladder, that organ frequently appeared to be filled with nitrogen, an element associated in many animals with the hibernating habit, or with change of food.

At the second meeting of the branch, held on the 22nd May, 1905, besides the chairman, Prof. Prince, there were present Professor Macoun, and Messrs. Lemieux, Baldwin, Campbell, and Halkett. Mr. Campbell showed some living specimens of branchiate larvæ, which appeared to be those of *Amblystoma*, and Mr. Lemieux brought a single antler of the Virginian Deer, which had been picked up beside a lake in the province of Quebec, soon after it had been shed. It was a fine example, and of unusual interest owing to the fact that shed antlers are very rarely found. The members present discussed the remarkable phenomenon, the annual shedding of deers' horns, the massive antlers of the moose being specially mentioned as surprising structures to grow in a single season, and then be cast away. Mr. Halkett shewed a specimen of the dor-mouse (*Eutomys rutilus*), which he caught with the hand, a year or two ago, at Madawaska, in the Nippissing district, and also a specimen of a bat (*Vespertilio subulatus*) which was found alive in the Fisheries Museum, and which is one of several specimens found there; and a scheme was discussed, led by Prof. Macoun, for securing specimens of small mammals in the vicinity of Ottawa. Small traps were described, which if set

in the evening, in suitable localities would in the morning be found to have secured interesting specimens. At most of the fishing clubs it was pointed out this work could be easily done, and specimens obtained from widely scattered localities. Professor Macoun offered to give information as to the best traps for the purpose, and it was agreed that the Muridæ, the Soricidæ, and the bats formed a most desirable line for the zoologists of the Club.

Samples of beaver work, with chips of wood, and a skull, from the Algonquin National Park of Ontario, were recently displayed in the windows of the Messrs. Orme, along with two mounted beavers from the Fisheries Museum, and they attracted much interest by the general public. The samples of the work of those interesting rodents were sent by Mr. Robert Lett, an employee of the Park, and the following is an extract from his letter concerning them: "I am shipping you to-day two samples of beaver work. ..... The larger of the two shews the tree a little more than half way cut through. The cut was towards the water so that their efforts to float or pull it under water to their house after having cut it up into short lengths would be lessened by a tree's length in distance when it came to the carry. Sample No. 2 shews a tree which has been felled completely. .. .. In the little tin box you will find some of the chips which these wonderful woodsmen made, when cutting on the larger tree..... .. I took my lunch in pocket one day and located these samples and on another day took saw and sleigh and brought them in." One of the samples—part of a birch-tree—was 10 inches in diameter, and the other some 8 ins. in diameter.

Under protective restrictions, the beaver (*Castor canadensis*) is multiplying rapidly in the Algonquin Park. Furthermore a colony of those interesting creatures is said to have established itself at Green Creek, some distance away, east of Ottawa, and they ought to be left unmolested.

Two red and one silver-gray foxes (*Vulpes fulvus*)—the three from the same litter—from about 150 miles north of Maniwaki, Gatineau district, a prairie coyote (*Canis latrans*) from Edmonton, and two racoons (*Procyon lotor*) from up the Ottawa near Shawville, P.Q., were recently displayed alive, and all together, in the windows of the Messrs. H. J. Sims & Co. One of the gentlemen

of that firm informs the leaders that the coyote was taken when two weeks old, and has become quite tame, so much so that it will answer a whistle and lick the hand. He runs loose in the yard and plays with the dog, and they are fast friends. The silver gray fox takes to the coyote in preference to the dog, although the fox and the dog were brought up together. There was also a musk rat placed in the window with these various creatures, but one of the foxes very soon bit it, necessitating its removal.

Although an exotic species, it may not be amiss to mention, that 13 specimens of the spring-bok (*Antidorcas euchore*) from South Africa, were recently exhibited in the windows of Mr. Slattery's store. These specimens of that beautiful antelope were sent to Ottawa for the annual dinner in commeroration of the battle of Paardeberg, held at Government House. Although outwardly very like deer, it may be pointed out, that the antelopes are more closely related to the oxen, sheep, and goats, and like these have hollow and permanent horns, instead of solid antlers, which are periodically shed, such as deer have. They are best represented in the continent of Africa which contains more species than any other part of the world. One species the prong-horn, or Rocky Mountain antelope (*Antilocapra americana*) is sometimes to be seen on the plains of our own far west.

The leaders of the branch desire to express their appreciation of the good which merchants and business men of the city occasionally do in attracting public attention to natural history objects, living or otherwise, by placing them in their store windows.

Mr. Lemieux contributes the following note in regard to: "Small Suckers in Lake Pembina, Lievre district."

"A small carp or sucker was discovered in the month of May in Morin's Creek. There were thousands and thousands of this fish, and they seemed to hide in the weeds, in fear of the trout that appeared to wage a war of extermination against those new comers. In September a smaller number were seen in front of the Club-house landing. This discovery is rather a surprising and unexpected one, as in the past no other fish than trout had been noticed in those lakes. Have these suckers been recently introduced, and how? This is a mystery, although I believe they were brought there in the egg-stage, by birds such as shell-drakes,

mergansers, &c., which visited other waters and returned to Pembina Lake with the eggs adhering to them. As is well known, suckers and carp are most destructive to spawn. However, I sincerely hope tnat the multitudes of trout in the Pembina will annihilate these suckers in a short time. Future observations on this subject will be eagerly expected and prove interesting. I have obtained a sample of this little fish."

The following is a list of fishes of the Ottawa District preserved in formalin in the collection of the Fisheries Museum, with the localities were they were found :

Silvery lamprey (*Ichthyomyzon concolar*). Ottawa River.

Rock sturgeon (*Acipenser rubicundus*). Lac des Chêne.

Gar-pike (*Lepidosteus osseus*). Vicinity of Ottawa.

Dog-fish (*Amia calva*). Ottawa River.

The two specimens of dog-fish have been long in the museum, and are labelled Ottawa River. Possibly they may have been found beyond the limits of the district, but are included in the list as shewing that that species exists in the Ottawa.

Horned pout (*Ameiurus nebulosis*). Gilmour's Mills, P.Q., Rideau Canal near Ottawa, and Kinburn, Ont.

White sucker (*Catostomus commersonii*). Vicinity of Ottawa.

Eel (*Anguilla chrysypa*). Gilmour's Mills.

Brook Trout (*Salvelinus fontinalis*. Gatineau District, near Ottawa.

Pike (*Esox lucius*). Gilmour's Mills, and a large head from Shirley's Bay.

Killifish (*Fundulus*). Hull, P.Q.

Brook stickleback (*Eucalia inconstans*). Stittsville, Ont.

Grass or calico bass (*Pomoxis sparoides*). Lewis Dam and Gilmour's Mills, P.Q.

Rock bass (*Ambloplites rupestris*). Near Hog's Back.

Pike perch (*Stizostedion vitreum*). Upper Ottawa River.

Ling (*Lota maculosa*). Lac des Chêne and Rideau River, near Ottawa.

There is also a large mounted maskinonge (*Esox nobilior*)

and specimens of various species in the collection which await determination.

A specimen of a muskrat (*Fiber zibethicus*) from the Rideau River, near St. Patrick's Bridge; and a specimen of an otter (*Lutra canadensis*) from Smoky Falls, some 9 miles from Sturgeon Falls, Ont., have been acquired by the Fisheries Museum. The former is of a cinnamon colour, the hairs being edged with white, and approaches an albino in its contour; whilst the latter manifests the opposite of this—a case of melanism, the specimen being almost jet black, and this is most striking when it is put beside a mounted otter of the usual brown colour.

A leopard frog (*Rana virescens*) was found jumping about near the Rifle Range, on the outskirts of the city, on the 27th January, 1906, during the unusually mild weather. It was handed alive into the museum of the Fisheries and is now preserved in formalin.

An article entitled; "The Eggs of the Scarlet Water-mite (*Hydrachna sulcata*)" by Prof. Prince, was published in the August issue of the OTTAWA NATURALIST, and since then Mr. O'Dell has been making some remarkable discoveries in regard to the metamorphosis which this mite, or perhaps an allied form, undergoes in the course of its life history, and he hopes shortly to publish what he has discovered.

Another thing of interest was the finding recently of the remarkable eggs of the fresh-water ling (*Lota maculosa*), an account of which will appear in the forthcoming number of THE NATURALIST.

An official list, prepared by Mr. Halkett, representative of such fishes of the Dominion as are preserved in formalin, as well as a list of specimens of other aquatic vertebrates, and of aquatic invertebrates, in the collection of the Fisheries Museum, forming Appendix XIV of the Fisheries Report, is now in the hands of the King's Printer, and will shortly be issued.

E. E. PRINCE.
ANDREW HALKETT.
W. S. ODELL.
E. E. LEMIEUX.

Ottawa, 6th March, 1906.

ERIOPHORUM RUSSEOLUM, FR., VERSUS *E. CHAMISSONIS*, C. A. MEY.

In an article on North American species of *Eriophorum* (Rhodora, Vol. 7, 1905) Mr. Fernald expresses the opinion that *E. Chamissonis*, Mey.. is identical with *E. russeolum*, Fr., hence the name of Meyer must be prefered, being the older. This article has been reprinted *ex parte* in THE OTTAWA NATURALIST (May, 1906) by Mr. James M. Macoun without further comment.

In recent years the matter of changing plant-names has, in America, been considered a most important point in botanical science, and far more so than the study of the plants themselves; that a number of these alterations have proved unsuccessful, we all know. Now, in regard to the proposed change of name of said *Eriophorum*, from *russeolum* to *Chamissonis*, I wish to state that this question was amply discussed some sixty years ago, and by authors who were familiar with the species of both. And I should think that the following statement, by Fries himself (Bot. Notiser 1848, p 6) would be more than sufficient to settle the question : "We are able to produce Meyer's own statement acknowledging identity of his *E. Chamissonis* with our Swedish *E. capitatum*."

THEO. HOLM.

Brookland, D.C., May, 1906.

THE IDENTITY OF ERIOPHORUM CHAMISSONIS AND E. RUSSEOLUM.

TO THE EDITOR OF THE OTTAWA NATURALIST:

I thank you for the opportunity to see the proof of the preceding note in regard to the identity of *Eriophorum Chamissonis* and *E. russeolum* and for your courteous invitation that I restate the reasons for considering the two identical. That question was discussed at length by me in Rhodora, vii. 83, 133 (1905); but, since your correspondent apparently sees in the attempt to clear the identities and relationship of our American Eriophorums only a "matter of changing plant-names" and has seemingly been unable

to follow the chief points in the discussion of *E. Chamissonis*, it becomes necessary to state the matter in simpler language. In doing so, however, I shall refer freely, in order not to over-crowd your valued space, to the discussion already published in Rhodora.

The elementary steps in my reasoning are as follows : —

1. *Eriophorum Chamissonis* of C. A. Meyer was named for Adelbert von Chamisso, who collected it "in Kamtschatka at Unalaschka" and who had called it in a letter *E. intermedium*, a name which was suppressed on account of the earlier *E. intermedium*, Bastard.

2. As first published in Ledebour's Flora Altaica,[1] and later in C. A. Meyer's "Cyperaceae Novae,"[2] the species was a complex of the Unalaskan and Kamchatkan plant of Chamisso and Altai material from some collector other than Chamisso.

3. These two elements of *Eriophorum Chamissonis*, as shown by Meyer's beautiful plate of the familiar plant of Kamchatka and Unalaska whence Chamisso secured his material and by Altai specimens distributed by Meyer, are quite different plants.

4. The Altai element of *Eriophorum Chamissonis* has been problematical. Material in the Gray Herbarium is *E. callitrix* (*E. vaginatum* of most American authors),[3] and by Nylander[4] it was considered a variety of *E. vaginatum*. By Fries, however, in 1842 (and again in 1844 as indicated by your correspondent), it was treated as identical with *E. Scheuchzeri*, Hoppe (*E. capitatum*, Host).[5] This identification of the Altai element of *E. Chamissonis*, sometimes with the densely caespitose nonstoloniferous *E. callitrix* and *E. vaginatum*, sometimes with the noncaespitose freely stoloniferous *E. Scheuchzeri* (*E. capitatum*), indicates that there were possibly three or four, instead of two, plants confused by Meyer under the name *E. Chamissonis*.

5. It is customary in case of a species containing mixed elements to interpret the species by the best available evidence. The

[1] C. A. Meyer in Ledeb. Fl. Alt. i. 70 (1829).

[2] C. A. Meyer in Mém. Sav. Etrang. Acad. St. Pétersb. i. 204, t. 3 (1831).

[3] See Rhodora, vii. 85, 134, 135 (1905).

[4] Nylander, Acta, Soc. Sc. Fenn. iii. (1852) according to Anders., Bot. Not. (1857) 58.

[5] Fries, Nov. Mant. iii. 170 (1842).

original description of *Eriophorum Chamissonis* both in the Flora Altaica and in Meyer's later and more elaborate treatment give the following characters.

a Root-stock repent, the culms solitary: "radix repens hinc inde protrudit culmos solitarios"—Fl. Alt.; "radix valde repens et hinc inde culmos solitarios emittens"—Cyp. Nov.

b. Spike oblong.

c. Anthers linear, about a line long.

d. Bristles of the Unalaska plant—the plant of Chamisso—reddish, of the very different Altai plant white: "lana longissima, alba (in specimine unalaschcensi rufa)"—Fl. Alt.; "lana copiosa, laevissima, in specimine fructifero pollicem superans, rufa (an semper?)"—Cyp. Nov.

6. There are only two repent plants with solitary culms concerned in the question of the identity of *Eriophorum Chamissonis*. One is *E. Scheuchzeri* (*E. capitatum*) with which your correspondent, following a statement of Fries rather than the original description and the clear plate of Meyer, would associate it. The other is *E. russeolum*, Fries, which, before he had seen the Altai element of *E. Chamissonis*, Fries himself recognized as unquestionably the plant meant by Meyer, saying in a discussion of *E. Chamissonis* with "spica oblonga" and 'antheris linearibus" from Lapland: "Reliquis nominibus nondum divulgatis *E. russeolum* diximus, quod vero nomen lubenter alio publicato supprimimus, ne inutilis synonymia augeatur."[1]

7. All botanists who know the two plants are perfectly definite in their statements that *Eriophorum Scheuchzeri* (*E. capitatum*) has the flowering spike broadly obovoid, in fruit becoming subglobose; the anthers cordate-elliptic, 1 mm. (½ line) long; and the bristles bright white. They are equally definite in describing in the words of Fries himself *E. russeolum* with "spica oblonga", "antheris linearibus", and "lana fulvo-rubella."[2]

8. Now, if we compare the leading characters of *Eriophorum Scheuchzeri* (*E. capitatum*) with those of *E. Chamissonis* as originally described, we shall find that it disagrees in having the flower-

[1] Fries, Nov. Mant. ii. 2 (1839).

[2] Fries, l. c. ii. 1 (1839), iii. 170 (1842).

ing spike broadly obovoid instead of oblong; the anthers cordate elliptic, about 1 mm. long, instead of linear, about 1 line (1.5–3 mm.) long; and the bristles bright white instead of reddish. These differences were perfectly understood by Meyer when he originally published *E. Chamissonis*; and it is quite clear that those botanists who, like your correspondent, maintain that Meyer had in mind *E. Scheuchzeri* (*E. capitatum*) cannot have taken the trouble to read carefully Meyer's original discussion of *E. Chamissonis*, for there Meyer says "*Er. capitatum Hoffm.* differt spica subrotunda spatham aequante nec non antheris brevibus cordato-ellipticis."[1]

9. When, however, we compare *Eriophorum russeolum*, or Fries's own description of it, with the original detailed description of *E. Chamissonis* and the fine plate of Chamisso's plant, we must admit that in their oblong spikes, long linear anthers, and reddish bristles, they are quite identical; and that in 1839, before being prejudiced by the confusion of the Altai element with the Kamchatkan and Unalaskan type of *E. Chamissonis*, Fries was quite right in deciding that it was best to suppress his own *E. russeolum*, a course which is followed not only by the writer but by Richter, and some other European students of the group.

The foregoing notes are much longer than I should ordinarily ask you to publish, but, since your correspondent has seen fit to doubt the care with which the identity of *E. russeolum* and the earlier *E. Chamissonis* has been worked out, it is necessary to restate what is already published in my earlier notes.

M. L. Fernald.

Gray Herbarium,
Cambridge, Mass., May 24, 1906.

[1] C. A. Meyer in Mém. Sav. Etrang. Acad. St. Pétersb. i 205 (1831).

SUB-EXCURSIONS.

Saturday, May 5th, was an exceptionally fine day for the excursion to Rockcliffe Park, a goodly number attended, and the presence of Dr. Whiteaves was very much appreciated, as he is an enthusiast in his work which Canada is only too slow to take note of.

Rockcliffe, under the magic wand of the Improvement Commission is breaking out into more than its usual beauty, or rather the beauties are being brought to light Glimpses of hill and stream never guessed before, burst into view, at every point. The different sections brought back their hoards to the meeting place in the grove near the Pavillion, and short talks were given by Pastor Eitrig, who has the German love of nature in his heart, on birds. Those seen and heard were :—

Hermit Thrush,	Bronzed Grackel,	Purple Martin,
Gold Finch,	Kentucky Warbler,	Barn Swallow,
Song Sparrow,	White-throated Sparrow,	Tree Swallow,
Junco,	Chipping Sparrow,	Red-winged Blackbird,
Purple Finch,	Herring Gull,	Phoebe,
Robins,	Meadow Lark,	Kingfisher.
Kinglet,		

Dr Ami who unfortunately is still on crutches from the accident to his limb drove down in order to be on the spot, and gave a talk on the stones and fossils found at Governor's Bay.

Mr. Andrew Halkett who is never so happy as when his pockets are bulging out with every creeping and crawling insect he can find, discoursed on the

1. Leopard frog (*Rana virescens*). Found by the edge of the Ottawa River.
2. American toad (*Bufo Americanus*). Found by Mr. Newman.
3. Numerous slaters or wood lice—isopods of the family Onicidæ —found under stones.
4. Egg capsules of spiders filled with eggs.
5. A few centipedes, millipedes, insects, slugs, etc.

Mr. McNeil, of the Fruit Division, is a recent acquisition to the Club, and promises to be a most helpful one. He spoke on the "Foundation of things," or the first things in geology.

"Governor's Bay," where so many of the geological specimens were found, is rich in material from a scientific standpoint. Some years ago an Indian mound was discovered here, and many Indian relics, showing that it was a place treasured by the aborigines, who generally made the most of the beautiful spots in the country.

M. McK. S.

NATURE STUDY—No. XXXV.

The Galt Park Wild-Flower Garden.

By R. S. Hamilton, Galt, Ont.

About six years ago through the generosity of a kind friend, the town of Galt came into possession of some thirty acres of woodland, lying on a rapidly rising upland, which forms the west bank of the river Grand and immediately adjoins the western limit of the corporation.

At one time this area was heavily timbered with white pine but later was devastated by fire. At the present time it is covered with a dense growth of young trees, such as red and white maple, white oak, wild cherry, juneberry and poplar, with here and there a tall white oak or beech, raising its head high above its fellows.

A condition attached to the gift was that the woodland should be left as far as possible in a state of nature. The present dense growth, however, and the consequent obliteration of herbaceous plants has robbed the region of much of the beauty of ordinary woodland, and some changes are in contemplation so as to bring it into a state more in keeping with the conditions that prevail in the majority of our Ontario woods.

The surface varies in its conformation. There is a gradual ascent to a divide on the western edge of the area; but this is broken by many minor sharp ridges and deep depressions, so that in one part may be found the conditions of dry rich woods, in another those of open and rocky woods, and here and there are the moist woods and pond conditions.

A commission of citizens, was appointed by the municipality to plan, construct and maintain a system of parks for the benefit and pleasure of the citizens of Galt. A competent landscape gardener was engaged, who after careful examination of the situation, drafted plans for a system of park development, which is at present in process of evolution. Driveways have been made and bridle paths cut through the underbrush. Feeble and stunted trees are being removed, so that the more perfect specimens may develop and light and air may penetrate.

Nature Study Club's Opportunity.—For several years Galt has had an enthusiastic Nature Study Club, organized as a scientific society, but latterly as an association in which nature study methods might be discussed and preparatory work done by the teachers of the town. Much interest has thus been created in

the observation of the things of nature and much aid has been given in intelligently conducting nature classes in the public schools.

In addition to the above, it has been felt for some time by the members that definite assistance should be given to those directly engaged in park adornment, and that under the guidance of their teachers, the children might be brought nearer to the beautiful things of nature and at the same time might help to preserve for generations to come, many species of plants, now threatened with extermination in the wholesale destruction of the woods in the vicinity of the town.

It has therefore been decided to establish a wild flower garden along that one of the bridle paths in the woodland in which there was the greatest possibility of showing the wood plants of the district in their natural habitats.

This work is now engaging the attention of the club, and, as it may present features of interest and may encourage other similar organizations to follow the example, an attempt is here made to give in detail the working plans of this scheme which has been entered upon with much enthusiasm.

Character of Area.—The bridle path, along which the wild flower garden will be made, runs in a general north and south direction. From the norh there is gradual slope for a short distance, passing into a sharp declivity which extends into a deep depression. This area is well wooded with maple, white oak and beech, and has a rich loamy soil, generally adapted for the growth of open and deep wood plants. At the foot of the declivity, the soil becomes damp and soggy and in places almost marshy. At the base of the hill are small ponds which are to be widened and deepened for water plants. The whole forms an ideal situation for growing wild plants under natural conditions.

Design of Garden. The general plan will be the organization of plant colonies. That is plants will be grouped together in families as far as possible in keeping with their soil and light requirements. The ground has been carefully examined and stakes driven where plants as brought in are to be located. Thus confusion and errors will be avoided by those aiding in the work. Along the path rustic arbors, and at both entrances arches, are to be constructed, over which native vines are to be trained.

Collecting and Planting.—The work of collecting and planting is to be done mainly by the school children under the superintendence of the teachers, so that each child and each teacher may have a share and a responsibility in connection with the undertaking. Each teacher will acquaint his or her class with

the general scheme and explain its purpose. To each teacher and class is assigned a gathering ground (to which, provided with a basket, trowel and strong knife they will proceed at the time appointed). Each supervisor of the collecting will keep an accurate record, and exact data will also be kept as to the locality in which the plants were found, the soil, number collected, etc. These records are to be preserved and will show what each class has done in the furtherance of the scheme.

The collecting for the day having been completed, all will go to the wood and establish their treasures in their new home. Thus in a pleasant outing much useful knowledge may have been gained, and each will feel gratified at having had a share in making their immediate surroundings more beautiful.

There are many plants which do not transplant easily. The seed of these will be secured at the proper season.

The following spring identification stakes of iron are to be placed in the several colonies, so that, to adults as well as children, a walk through this wild garden may be not only a wayside fountain of knowledge but its beauty will prove a perpetual charm to the eye.

Aims.—To enlist the sympathy, interest and co-operation of children in doing something to beautify the town they live in.

To rescue from the ruthless hand of the destroyer many varieties of plants which in the ordinary course of events would shortly become exterminated.

To make each individual worker realize not only that he has had a share in constructing the garden but that he has an interest in protecting and caring for every flower in it.

To widen the child's view of nature, to bring him into close contact with plant life and the conditions under which it is maintained.

What and When to Plant.—Speaking generally plants will be secured after the flowering season is over, when they will be best transplanted. In certain cases seeds will be collected as well as the plants and scattered in the colonies, thus aiding in the perpetuation of the species. Below is given a partial list of plants, suitable for transplanting to conditions indicated.

Any plants thought to be beautiful or interesting by each collector are suitable for such a wild garden, which, to be of the greatest educational value, should have the plants of the same nature or requirements grouped together.

I. For rich woods area :—

Hepaticas,
Rue Anemone,
Early Meadow Rue,
Fringed Polygala,
Barren Strawberry,
Bishop's Cap,
False Mitrewort,
Smoother Sweet Cicely,
Hairy Sweet Cicely,
Prince's Pine,
Shinleaf,
Trilliums,
Dog's-tooth Violet,
Wild Sarsparilla,
Gold Thread,
Blue Cohosh,
May Apple,
Blood Root,
Dutchman's Breeches,
Squirrel Corn,
Violets,
Spring Beauty.

II. In damp woods area :—

Touch-me-not,
Wild Cranesbill,
Indian Turnip,
Skunk Cabbage,
Maiden-hair Fern,
Marsh Marigold,
Toothworts.

III. For pond society :—

Water Plantain,
Arrow-head,
Polypody,
Aspidium,
Marsh Marigold,
Common Yellow Pond Lily,
Water Shield,
Sweet Scented Water Lily.

IV. Dry and rocky area :—

Butterfly Weed,
Bladder Campion,
Wild Lupine,
Early Wild Rose,
Herb Robert,
Purple Flowering Raspberry,
Wood Anemone,
Wild Columbine.

V. Climbers for arbors :—

Virginia Creeper,
Carrion Flower,
Climbing Bitter-sweet.
Virgin's Bower,
Honeysuckle,
Moonseed.

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SOME CANADIAN ANTENNARIAS.—III.

By Edward L. Greene.

In the May issue of the NATURALIST for 1904, I remarked how plainly British Columbia was being indicated as the centre of distribution for the genus *Antennaria* on the Pacific slope of the continent. And now, another ample collection of these plants, made there in the summer of 1905 by Mr. James M. Macoun, strongly confirms the opinion then expressed. No fewer than three of his numbers seem to represent species quite new; while others of them are almost as welcome as completing our knowledge of some that were hitherto known but imperfectly.

A. EXIMIA. Stems stoutish a foot high more or less, erect, above a slightly decumbent base, the basal stolons short, densely leafy, their leaves not large for the plant, about 1 1-2 inches long, narrowly obovate-cuneiform, mucronate, thinnish, rather loosely and silkily lanate beneath, above bright green, glabrous, minutely whitish-punctículate, very narrowly white-margined by extension of the wool of the lower face; stem-leaves many and approximate, the lowest quite as large as those of the stolons but narrower, oblong-cuneiform; heads many and large, forming an ample compound corymb 2 or 2 1-2 inches wide across the summit; involucre much imbricated, its outer bracts arachnoid-woolly and greenish, with short scarious tips or none; the inner successively obtusely and then acutely or acuminately scarious-tipped. Male plant unknown.

Skagit Valley, 12 July, 1905. Geol. Surv. n. 69,338. Mr. Macoun gives for this the habitat of open sandy woods, through which fire had repeatedly run, at 2500 feet altitude; and I note in the specimens evidence that it grows in beds of moss of the genus *Polytrichum*. It is a handsome species, apparently related to the next, though much larger.

A. CHLORANTHA, Greene, Ott. Nat. xviii. 38. This was originally described from specimens of the year 1901, and much too young. The numbers 69,353 and 69,354 of 1905 together enable one to complete the description of what is a most satisfactory species. In its maturity, as shown in n. 69,354, collected August, 1905, the plant is 7 to 9 inches high, the involucres not sessile, but even quite loosely corymbose-panicled and about twice as numerous as in the originals. The achenes are distinctly though sparsely scabro-hirtellous.

A. ERIGEROIDES. Slender but rather rigid and wiry, the flowering stems 8 to 12 inches high: stolons with small foliage narrowly spatulate-oblanceolate, compactly silky-lanate on both faces, the upper glabrate only in age; stem leaves narrowly linear-falcate, sharply acuminate, all but the uppermost curving away from the stem; heads distinctly racemose, a few at the very summit only more crowded and subcymose; pedicels of the scattered and racemose ones filiform, 1-2 to 1 inch long and suberect; scaricus tips of the involucral bracts all obtuse, pinkish: staminate plant not known.

Skagit Valley, 27 June, 1905, at an altitude of 4,500 feet, Mr. Macoun; Geo. Surv., n. 69,346.

A. MODESTA. Low, the leafy and floriferous stems only 2 to 4 inches high and almost filiform, either monocephalous or with several additional heads on slender pedicels racemosely arranged: stolons short, crowded, densely leafy, their leaves 1-2 inch long or less, oblong-cuneiform, densely whitish-tomentose on both faces; stem-leaves thin, oblong, acute, suberect, more loosely woolly and the wool deciduous from the upper face, the slender stem itself and the pedicels floccose and the wool deciduous, or partly so; involucres small, narrow-campanulate, the bracts dark and brownish, their tips long, acuminate, greenish-brown.

Altitude of 6000 feet in Skagit Valley, 25 July, 1905, Mr. Macoun. Plant of the *A. alpina* group by its involucre but of peculiar habit and a subracemose inflorescence.

Washington, D. C., June, 1906.

THE CARIBOU OF QUEEN CHARLOTTE ISLANDS.

In the issue of THE OTTAWA NATURALIST for February, 1909, Mr. Ernest Thompson-Seton described a new species of caribou from the Queen Charlotte Islands. The species was founded on a fragmentary skull and one horn but the description of the skin given by a gentleman who saw it and a comparison of the skull with that of allied species seemed to warrant Mr. Thompson-Seton's conclusion that the caribou of the Queen Charlotte Islands was an undescribed species. However this may prove to be the more important question of whether there are really caribou on Graham Island or not has been doubted by many residents of British Columbia. This doubt has now been set at rest by Commander Hunt and Lieut. Bills, of H. M. S. Shearwater, whose account of their visit to Graham Island is printed below. It is due to the kindness of Mr. F. Kermode, Curator of the Provincial Museum at Victoria, B. C., that the EDITOR is enabled to supplement the very complete account given by Mr. Thompson-Seton of what was at that time known of the Graham Island caribou by this later information. The tracing of the footprint referred to in Messrs. Hunt and Bills' report has been shown to several gentlemen who have seen caribou tracks and all pronounce it to have been made by that animal. Messrs. Hunt and Bills report as follows:

"For some years past the question of the existence of caribou on Queen Charlotte Islands has been frequently discussed by naturalists and sportsmen. A pair of antlers, supposed to have been taken from a caribou shot on these islands, was sent from Graham Island to Victoria some years ago, but this, we believe, is the the only specimen which is known to have come from that island, and sceptics have suggested that the head probably came from the mainland and was traded with the Indians of the islands.

"From time to time various persons who have visited the islands have reported tracks of animals of the deer family, but, in view of the fact that wild cattle are known to wander about inland, it has been thought that these were responsible for the tracks. As far as we can ascertain, no pair of antlers has been taken from the islands for some years, and, apart from the horns mentioned above, over whose authenticity doubts have been cast, naturalists were in doubt as to the nature of the animal which,

reports stated, lived on the islands. We believe that the latest rumor on the subject was to the effect that the animal was a wapiti.

"A favourable opportunity having occurred to investigate the question, we set out on the 22nd February, 1906, from Hussan Point on the west side of Virago Sound and struck inland in a westerly direction. The country was timbered, but fairly open, and the going good, thick patches of sal-lal being frequent. After forty minutes packing we emerged upon the open crest of a hill, and here saw tracks of some large animal of the deer family. The open space was about half a mile long and 300 yards broad, covered with a thick carpet of moss in which were dotted numerous small pools of water. A few stunted trees grew about,—for the most part in a withered condition.

"This open space was the first of many which we found in the area of our wanderings and nearly all showed tracks in a greater or less degree. These open spaces crown nearly all the hills (none of which can be more than 400 or 500 feet in height) and between them are patches of bush more or less dense and all containing a good deal of sal-sal. In a few places we came across the tracks in the bush, but the nature of the country doubtless prevented us from noticing many others.

"According to the Graham Island Indians (the Hydahs) snow to the depth of two or three feet had covered the hills up to a few weeks before our arrival, but this had disappeared save a few isolated patches which were fast melting.. In three different patches of snow we saw tracks of a deer-like animal, but they were probably two or three days old and the melting of the snow had caused them to lose their original sharpness.

"It was our intention to take photographs of any clear tracks, but those in the moss did not lend themselves to such procedure and those in the snow were too indistinct. A sketch was made of one fresh hoof-print found in the thick moss and careful measurements made. It is by no means one of the largest seen, but was sufficiently sharply defined to enable sketch and measurements to be taken.

"We saw a good deal of dung in the open spaces, and a little in the bush: it was always in small heaps of rounded black substance and appeared to be that of caribou. Some appeared to be fairly fresh, but none was seen that we would consider less than forty-eight hours old. At the edge of one of the open spaces

we found a shed antler lying in the moss, undoubtedly the left antler of a caribou.

"As a result of our investigations we are perfectly convinced that a species of caribou does inhabit the northern part of Graham Island and would give the following reasons for our opinion:—

1. The tracks are plentiful of all sizes, some quite fresh, and are undoubtedly tracks of a large animal of the deer family. In the sketch the distinctive dew-claws of the caribou are perfectly marked.
2. The dung seen was certainly not that of a wapiti; the tracks point to a very large animal of the deer family.
3. That the shed antler was deliberately taken into the country and left to be discovered is a point that may be dismissed as very improbable.

We were, unfortunately, unable to actually see a caribou, although we searched for three days in both the bush and open country.

"The Indians living at Virago Sound are quite positive about the existence of caribou, but state that they are never seen on the west coast of Graham Island, and a search over the open plain extending to the west of the area marked on the attached plan failed to reveal any tracks. We could get no information of tracks having been seen south of Naden Harbour, and so have come to the conclusion that the caribou are, for some reason, only found within a small area of the N. W. portion of Graham Island.

"Whether this caribou is of the barren ground or woodland variety must be left to the naturalists to decide, the shed antler appearing to us to favor either variety. From the fact that our continuous search in the open failed to discover an animal, this caribou would appear to prefer the bush to the open.

"We interviewed an Indian (by name George Hallett) who stated that five years ago he had shot three caribou, and his description of the size and appearance of the animals was fairly accurate. As he stated they had no horns they were probably shot out of season. George Hallett also said that another Indian who once accompanied him on a hunting trip had shot a caribou with large antlers: that these antlers had been

sold to the late Mr. Mackenzie, of Massett, who sent them down to Victoria."*

Dr. R.W. Ells, of the Geological Survey who spent the season of 1905 on Graham Island, furnishes the following additional information which though of uncertain value if standing alone, affords strong corroborative evidence when read with what is printed above. Dr. Ells writes in his report:

"During the winter months certain members of the tribe (Haidas) engage in hunting, principally the bear, which appeared to be quite numerous, especially in the country around the Yakoun river and lake and in the southern half of the island. Of other large animals there appears to be a scarcity, though the Rev. Charles Harrison, of Masset, asserts that caribou have been found in the country adjacent to Virago Sound. As very few white people have ever attempted to penetrate the dense forest of the interior the presence of this animal might easily escape notice.. During out boat journey along the north shore west of Virago Sound several forms like deer were observed feeding along the beach. It was supposed at the time that these might be wild cattle but as the herd of these is so far as known confined to the area east of Masset Inlet and as no trace of them has been reported from this part of the island, it is quite possible that the animals seen may have been deer. Our boat was at the time too far from land to determine this point definitely."

A CORRECTION.

In Dr. Holm's note on Eriophorum in the last number of THE NATURALIST the date of Fries' paper should have read "1844" instead of "1848". Dr. Holm did not see a proof of his note and the misprint was overlooked by the editor.

*This is doubtless the antler described by Mr. Thompson-Seton.—THE EDITOR.

IVY POISONING AND ITS TREATMENT.

Nine years ago the writer was severely poisoned by handling *Rhus toxicodendron* and though he has since taken great care when in its vicinity few seasons have passed in which he has escaped. In his own case many remedies have been tried, that which has proved most efficacious being lead acetate and alcohol. In a paper published in *Rhodora*, (Vol. IV., pp. 43-45). Dr. Franz Pfoff gives the results of a very thorough study of *Rhus toxicodendron* and *R. venenata*. He discovered that the active principal was an oil which he named "Toxicodendrol" which he found in all parts of the plant at all seasons. A sample of the oil kept in an open porcelain dish for over thirteen months proved to be as active as ever before. Dr. Pfoff also found lead acetate to be the best remedy, and as cases of ivy poisoning are very frequent here, his directions for removing the poison and keeping it from spreading may well be reprinted. He says:

"This can be done by vigorously washing the affected exposed parts with soap and water and a scrubbing brush; that is to say by mechanically removing the oil. As the active principle is very soluble in alcohol and gives with lead acetate a precipitate which is nearly insoluble in alcohol, other processes may be employed to remove the oil. The exposed parts may be washed repeatedly with fresh quantities of alcohol and a scrubbing brush. The poisonous oil may be thus removed in alcoholic solution of lead acetate; in this case the poisonous principle would be first transformed in its insoluble lead compound and then washed away with alcohol.

"The washing must be done thoroughly when alcohol is employed, as otherwise the alcohol might only serve to distribute the oil more widely over the skin. The finger nails should be cut short and also perfectly cleaned with the scrubbing brush. Oily preparations, or anything which dissolves the poisonous oil, if used, should be immediately removed, as they may only spread the poison, giving it a larger area on which to work.

"The treatment above outlined can not cure the already inflamed parts which must heal by the usual process of repair, but it does prevent the spreading of the inflammation and may serve to remove the poison before it has had time to produce its characteristic effects upon the skin."

In a later number of Rhodora, (Vol. IV, p. 100) Mr. L.E. Am-

midown, who describes himself as being very susceptible to ivy poison, tells of a preventive which makes it possible for him to visit localities in which it is abundant without being affected. He says: "I take with me a bottle filled with a strong solution of saleratus (the common kind used in cooking). When I come out of the swamp I wash my hands, face and neck—wherever it is possible that the poison has touched the skin—with the solution. Since doing so I have never been poisoned and can roam through the place at will. I take no needless risks and am always careful not to touch the dogwood (*Rhus venenata*) if I see it. However, it is so thick that it would be impossible to avoid it altogether."

Everywhere for nearly a mile along the east side of the Beaver Meadow the ground is covered with poison ivy, spoiling for many collectors one of the most interesting fields for botanical work in this vicinity. Rockliffe, too, is a dangerous place to visit for those who are at all susceptible. With proper care and a prompt use of the remedies given above the danger of serious poisoning will be greatly lessened if not entirely removed.

J. M. M.

THE CONNECTICUT VS. THE KENTUCKY WARBLER.

A Correction.

In the report on the sub-excursion of the club to Rockliffe, May 5th, I am inadvertently made to report having seen a Kentucky warbler (*Geothlypis formosa*). While I would have been delighted to again meet this old acquaintance of mine from the south, I must state that it was the Connecticut warbler (*Geothlypis agilis*) I saw. This is a great rarity anywhere and has been reported for Ottawa only once before by Mr. J. Fleming, of Toronto, who saw it also at Rockliffe. The song of this bird is very characteristic and cannot easily be mistaken for that of another. It begins with some very low notes, as though the bird was inhaling, then a few a little louder, exhaling, and then several loud, liquid, bubbling notes, in the pitch of the oven-bird or water-thrush. This song I heard May 2nd from a tree in the city, once on the same day at Britannia and May 5 at Rockliffe, before I saw the bird plainly. So it may, after all, not be so rare here.

C. W. G. EIFRIG.

THE GREAT GRAY OWL.

REV. C. W. G. EIFRIG.

The great gray owl, (*Scotiaptex cinerea*) is one of the rarest and most mysterious visitants to this part of Canada. Its movements, its coming and going are as eccentric and unfathomable as those of the snowy owl, pine grosbeak, Bohemian waxwing, and others of our true Canadian birds. At the same time it is one of the birds concerning which the least data and observations are available. Its range extends from Lake Superior to the Yukon and from Hudson's Bay to the Pacific Ocean. Here it does not live in open country, in the "barrens," as does the snowy owl, (*Nyctea nyctea*), but confines its operations to the large, dense forests of the region. From here it does not stray far, rarely passing the southern boundary of the Dominion. Mr. Donald Gunn states that this owl is to be found summer and winter throughout all the country commonly known as the Hudson Bay Territory. Nor is it abundant even there, in its chosen habitat, as Mr. McFarlane, who has been in the employ of the Hudson Bay Company in the Anderson River district since 1859 or '60, states that he obtained but "very few specimens", although he is a very gifted naturalist and keen observer. No wonder then, that records of their nests are also few and far between. I can find two records only, quoted both in Bendire's Life Histories of North American Birds, and Baird, Brewer and Ridgeway, North American Birds. One nest was found on a 23rd of May, by Dr. Richardson, "on the top of a lofty balsam poplar, composed of sticks with a lining of feathers. It contained three young birds covered with whitish down." The other was found by McFarlane, "on the 19th of July, 1862, near the Lockhart River, on the route to Fort Good Hope; it was built on a spruce pine tree at a height of about 20 feet and was composed of twigs and mosses, thinly lined with feathers and down. It contained two eggs and two young both of which had lately died." Their food is, according to Mr. Gunn, rabbits and mice, whereas Mr. Dall found in the stomach of one shot in April 20th, in the Yukon, the remains of thirteen redpolls, (*Leanthis linaria*). Of nine stomachs examined by Prof. K. Fisher, of Washington, one contained a small bird, seven mice and four other mammals.

However, the reason for writing this study was not the giving of these data, but rather to record the exceedingly great disparity between the large size of the bird and the smallness of the

body when taken out of the skin and feathers. It is always a matter of surprise to see the small body of all owls as compared to the apparent large bulk of the birds, but the great gray owl beats the other owls, like the barred, great horned and the snowy, all to pieces in this respect. During our last cold season three of these owls, shot near Ottawa, have come to my notice. One was shot last November by a farmer in South March, the second about February 1st, near Templeton, Quebec, and the third about the end of March, locality unknown. All three found their way to a local taxidermist, from whom I procured the second one. Being familiar with the small size of owls' bodies, still I was not prepared for anything like this proved to be, when it was prepared and mounted. The great gray owl is in appearance our largest owl, it measures in length 25-30 inches, extent (wings spread) 54-60 inches, tail 11-13 inches. Its large facial disk, much larger than in other owls, heightens the impression of largeness, besides making it appear somewhat solemn, mysterious and uncanny. The body taken out from this owl, i.e. the trunk, without skin, head and wings, measured only, length 6 1-2 in., depth, i.e., from breastbone to back 3 3-8 in., width across thorax 2 1-2 in., weight 8-10 oz. It was much smaller than the body of the great horned and even barred owls; as large as a half grown ruffed grouse and then not as wide. Of course this specimen was extremely emaciated, but that would not decrease the size of the skeleton. It was so thin as to be transparent in the abdominal region; of intestines there was not much to be seen and the stomach was empty. It is hard to understand how such a tiny body compared to the bulk of the bird could keep up the huge wings, heavy claws and enormous head, whose circumference measures 20 inches, the facial disk alone, 6 inches! There was so little flesh on it, that it did not decay, but only dry up in the winter air. This seems to show also that this owl can eat very little only of a rabbit, if it catches them at all, and it seems much more likely that it confines itself to small birds and small mammals, like mice, for food. No wonder the books express astonishment at the relatively small size of their eggs which are hardly any larger than those of the barred owls, a much smaller bird in appearance. The egg of the latter, as figured in Bendire, measures 2x1-75 in., that of the former 2.125x 1.73 inches. While this seems small when compared with the eggs of birds smaller in appearance, like ducks, grouse, etc., it

seems still almost incredible that a body of the above given smallness can produce an egg of even this size. This owl, now in my collection, measures mounted, with the neck somewhat shortened, 25 inches in length.

CURIOUS NATURAL FREAK.

In the garden of Mr. Cowley on View street, in this city, is to be seen a laburnum tree producing three distinct varieties of flowers, viz:—yellow and pink laburnum flowers and mauve-colored spikes of broom-like flowers. Mr. Cowley made the following statements regarding the tree: About eighteen years ago he bought the plant from the late Mr. Henry Mitchell as a pink laburnum a sport from the ordinary yellow laburnum. It proved true to its name, and produced pink flowers for a number of years. The tree grew quite large, and then Mr. Cowley cut it back when, to his astonishment, it produced a thick broom-like growth, resembling bunches of mistletoe, which produced spikes of rose or mauve-colored flowers, resembling broom, different in every respect from the original laburnum blossoms. Two years ago the tree showed a disposition to hark back to its original form, as it produced a spike of yellow flowers; last year more appeared, and at the present time the tree presents the curious appearance of producing pink and yellow laburnum flowers, and spikes of the broom flowers described.

Mr. C. N. Young, of Duncans, on hearing of the curious freak, wrote as follows:—"I have known a similar case. On the lawn of the rectory at Quainton, near Aylesbury, a large laburnum tree, forked at eight feet from the ground, one half bore yellow, the other pink flowers; while from the fork grew a bunch of citisus bearing purple flowers.

"The late Professor Lindley, then editor of the Gardeners' Chronicle, expressed it as his opinion that the original tree was produced by crossing the yellow laburnum with the purple citisus, and that the tree had combined the peculiarities of both parents and offspring."

I send specimens of the flowers for inspection by the curious.

J. R. ANDERSON.

Victoria, B. C.,
1st June, 1906.

REPORT OF THE ENTOMOLOGICAL BRANCH, 1905.

Read March 27, 1906.

The Leaders of the Entomological Branch have pleasure in reporting that during the season of 1905, the entomologists of the Club have been actively engaged; much good collecting having been done and many new facts discovered concerning the life-histories of various species of insects. The season on the whole was an unproductive one in the Ottawa district, the cool nights and damp weather being very discouraging and hindering much in the plans for excursions, etc., which had been made by the Leaders. Notwithstanding the disappointing season, by dint of persistent effort good work was done by some of the members of the Club and many new records of insects were added to the local lists.

The fortnightly meetings held in the early part of the year were very helpful to the members who attended them, and much useful information was brought out in the discussions following the reading of papers. These meetings of course are open to any members of the Club and as they are very informal in nature, all wishing to take up the study of insects are welcome to attend and could quickly gather much useful and interesting information.

No reports of the Entomological Branch have been published in the OTTAWA NATURALIST since that for 1902 which appeared in the September number for 1903, but full accounts of the meetings of the branch have appeared from time to time and furnished the same information as would have been given in a report. A few new members have joined this Branch of the Club but the field is so large and so much of it is yet to be worked that the Leaders sincerely hope that more students will join them during the next season.

Valuable work has been done for the science of entomology by some of our members who have visited or who are living in localities distant from Ottawa. The Rev. G. W. Taylor, of Wellington, British Columbia, has taken up the study of North American Geometridae and has already added largely to our knowledge of those interesting moths. Mr. Jos. Keele and Mr. J. Wilson, both of the Geological Survey staff, have brought back from the far north small but valuable collections of different or-

ders of insects. Mr. Keele explored the Valley of the Mayo River, Yukon Territory, in 1904 and worked along Lansing River, Hell River and Ladue River in the same Territory in 1905. Mr. Wilson was exploring on the Hudson River slope in 1904, and in the Temagami district in 1905. As both of these gentlemen took great care to label their specimens accurately, even the small number they brought back, have distinct and great scientific value. Mr. Andrew Halkett, who was naturalist on the Neptune expedition under Commander Low, in 1903-4, brought back a surprisingly large number of species of insects from the Hudson Bay region. Mr. H. H. Lyman, of Montreal, who joined the Labrador expedition, sent out to observe the total eclipse of the sun, found opportunity to collect specimens and make observations. Mr. Norman Criddle and Mr. T. N. Willing, two of our Northwestern members, have prosecuted their studies of insects and plants most vigorously and with very important results. Many new species have rewarded their efforts and a vast amount of useful knowledge has been accumulated during the past few years.

Of our local members perhaps Mr. C. H. Young's work among the micro-lepidoptera is most worthy of mention. The exquisite manner in which Mr. Young prepares his material is well known to us all but the value of his work is chiefly due to his skill in rearing large series of insects so as to compare the limits of variation. Mr. W. D. Kearfott, of Montclair, N. J., has been indefatigable and most generous in helping our members with the indentification of their captures of these minute and most beautiful moths. Mr. W. Metcalfe has taken up the study of the order Hemiptera and is gradually compiling a complete list of the Ottawa species. His material has been named by the leading specialists and we hope that it will soon be ready for publication.

Our two highly esteemed corresponding members, Messrs. J. B. Smith, State Entomologist, of New Jersey, and Prof. H. F. Wickham, of the University of Iowa, as in the past, have rendered invaluable service to our members by helping with identifications and sending us for the Library their useful publications.

Among many rare and interesting insects which have been taken mention may be made of the following:—

LEPIDOPTERA:

Papilio machaon, L. var. *aliaska*, Scud, an exceedingly rare insect, was taken in the Yukon Territory by Mr. Keele, and on the Nagagami River on the Hudson Bay slope, by Mr. Wilson.

Papilio brevicauda, Saunders. The larva was found at the North-west River post of the Hudson Bay Company, on Lake Melville, Ungava, by Mr. Lyman.

Pontia protodice, B. & L. The second specimen taken at Ottawa, Sept. 27 (Gibson.)

Eurymus boothii, Curtis. Three specimens of this remarkably rare Coliad were taken in the Yukon Territory by Mr. Keele in the beginning of July.

Erora laeta, Edw. Two specimens of this beautiful little Thecla, Meach Lake, Que., May 18 (Young).

Amblyscirtes samoset, Scud. Chelsea, Que., May 28. (Gibson & Campbell).

Pamphila palœmon, Pallas (*mandan*, Edw.) Eastman's Springs, July 1 (Fletcher).

Anthomaster leonardus, Harr. Britannia, Aug. 23. (Baldwin). This skipper is very rare at Ottawa and has not been taken for 25 years.

Utetheisa bella, L. Sept. 25 (Fletcher), the second specimen taken at Ottawa.

Phragmatobia assimilans, Wlk. var. *franconica*, Sloss. Meach Lake, May 16 & 17 (Young); Ottawa, June 3 (Gibson).

Apantesis celia, Saunders. Ottawa, pupa, May 9th, moth June 7 (Baldwin).

Semiophora elimata, Gn. Meach Lake, May 8 (Young).

Semiophora opacifrons, Grt. Meach Lake, Aug. 7 (Young.)

Barathra occidentata, Grt. This rare moth has not appeared for many years at Ottawa but during the summer of 1905 the moths were abundant during the latter half of June and the larvæ were noticeably destructive in gardens during late summer. The insect also occurred in Quebec and Nova Scotia. The life history has been worked out and is published in the Report of the Dominion Entomologist.

Polychrysia formosa, Grt. Meach Lake, Aug. 15 (Young), a very beautiful and rare species.

Autographa rubidus, Ottol. Meach Lake, June 5. (Young).

Melipotis fasciolaris, Hbn. Mr. Baldwin took a fine specimen of this West Indian moth in his garden on July 6 last. This is the first Canadian record and it is probable that the insect was brought north in a bunch of bananas.

Stenopis thule, Strk. One of the most important captures of the year was made on July 6 by Mr. Gibson when he secured a perfect specimen of this striking and very local moth near the Experimental Farm. Up to the present time there is no known authentic record of it having been taken at any other place than Montreal.

COLEOPTERA

A few specially interesting captures of beetles have been made at Ottawa during the past season.

Pityobius anguinus, Lec. Six specimens of this fine elater were taken at electric light at the end of June (Gibson and Baldwin), and a female was secured a month later floating in a water barrel, (Fletcher).

Aphorista vittata, Fab. Aylmer, April, (Gibson).

Odontæus cornigerus, Melsh. Ottawa (A. E. Richard).

Pachyta rugipennis, Newm. Hull, Que. About 40 specimens of this very rare longicorn beetle were taken by Mr. W. Metcalfe pairing at the base of a dead pine tree May 29, 1904.

Anthaxia æneogaster, Lap. This little Buprestid beetle, which is frequently found in the flowers of Trillium in Spring, was observed to be ovipositing on the trunk of the same dead pine tree, and at the same time as Mr. Metcalfe collected *Pachyta rugipennis*.

Phytonomus punctatus, Fab. The Clover Leaf Weevil, which has occasionally done considerable harm to clover fields to the south, was detected at Ottawa for the first time in 1905 when two specimens were caught at the Experimental Farm.

An important work has been accomplished in the examination of the whole of Mr. Harrington's Dytiscidae, by Mr. John D. Sherman, Jr., of New York, who has found in the collection some very interesting species. The members of the Club are urged to make use of this opportunity to get their material identified and also to make a special effort this year to collect these insects.

The following are species of more than usual interest which have been found at Ottawa, and are among those which have not yet been recorded from the district:—

Desmopachria convexa, Aube. *Bidessus lacustris*. Say, *Coelambus turbidus* Lec., *Deronectes depressus* Fab., *Hydroporus pulcher*. Lec., *H. solitarius*, Sharp, *Ilybius pleuriticus*, Lec., *Agabus semipunctatus*, Vichy, *A. reticulatus*, Vichy, *Rhantus sinuatus*, Lec, *Hydaticus stagnalis*. Fab., *H. piceus*. Lec., *Dytiscus hybridus*, Aube, *D. marginalis*. *Linn*, and *Acilius semisulcatus*. Aube.

The publication of a complete list of the Ottawa Dytiscidæ, is most desirable, as that published in Transactions No. V, page 73, is obsolete and several of the determinations were erroneous.

JAMES FLETCHER,
W. H. HARRINGTON,
C. H YOUNG.
ARTHUR GIBSON,
} LEADERS.

SUB-EXCURSIONS.

Saturday, June 9th.—Seven naturalists took their way to Billings' Bridge on Saturday afternoon. The party being small, they did not separate into different groups, as is customary on these "excursions."

The tempting shade of a beautiful "glen" seemed more inviting than a prolonged walk in the burning sun, to our usual haunt, "Rideau Park." So after a short consultation, we entered "Fairy Realm," and saw the wood-anemone, in all its grace and beauty, dotting the bank, side by side with the lovely fleabane. Nature is always charming with her variety, and contrast of colors.

In some places the ground was carpeted with moonseed, (*Menispermum Canadense*). It was too early in the season to get the flowers of this pretty vine, although the bud was now forming. It had coiled itself around every unsightly object, such as, old roots, dead branches, etc., "and wreathed them with verdure, no longer their own." After climbing up a rocky way which must have been a foaming torrent, the night before, we found ourselves, a group in the centre of a magnificent picture

where the many waterfalls, and tiny rivulets were again indications of the previous storm.

The deeply indented leaves of the white lettuce (*Prenanthes*), were very conspicuous, interspersed with bunches of a darker hue, showing where the hepatica's blossom had been most luxuriant and sweet cicely's delicate flower added it's charm to this verdant landscape.

All prosaic ideas vanished. Nature inspired, or suggested her own poetic thoughts which were expressed in more joyous tones, we too became one with her, and felt happy, "Where love is all things interest." Therefore everything was interesting to us lovers of nature. Even the grass looked at us from eyes of blue, (Blue-eyed grass), and the birds sang, or busied themselves with their own affairs, unconscious of, and oblivious to our observation.

After a delightful afternoon spent in "Fairy Realm," we entered a grassy lane, like the entrance to some enchanted castle, nor was the spell broken, when Mr. Halkett from his crystal jar pointed out some of the wonders of the "Insect World."

Mr. Clarke picked up a few valves of the marine bivalve mollusk, known *Saxicava rugosa*, whilst walking along the railway track, which had doubtless been conveyed there in ballast, procured at no great distance from the place where found.

Mr. Halkett found some fine specimens of land-shells (Helicoids), with the living snails, a scarlet araclinid, several caterpillars, including a mature specimen of the tent caterpillar (*Clisiocampa*) which he mentioned as likely to prove a menace to the foliage of trees again, after having been nearly suppressed by the frost a season or two ago; and also said he had observed the day being warm a profusion of insect life representative of various orders.

Some of the flowers collected were: Black snakeroot, with inconspicuous greenish yellow flowers. None of us examined the roots to find out its snakey qualities; everlasting; black mustard; common hound's tongue, (*Cynoglossum officinale*), now beginning to show its dull purplish flowers in the fields; mouse-ear chickweed (*Cerastium arvense*); the Canada violet, (*Viola Canadensis*); small-flowered crow-foot (*Ranunculus*

abortivus); butter-cup, (*Ranunculus acris*); white baneberry, (*Actaea alba*); blue cohosh, long past its flowering stage; wild ginger; red osier dogwood; wild sarsaparilla, not yet in bloom, roots aromatic; we saw bushes of the wild gooseberry and wild black-currant, but the fruit was still too green to be edible. The Heath family was represented only by some few pyrolas.

After a delightful afternoon, and a refreshing drink of pure water, we returned to the city, and felt better fitted for our duties by this excursion with the Naturalists.

ANNIE L. MATTHEWS.

RECORDS OF RARE BIRDS IN THE MARITIME PROVINCES.

I take pleasure in recording the capture of three interesting birds. February 11th, 1905, at Argyle Shore, Prince Edward Island. An albino white-winged female crossbill was secured from a flock of about twenty properly colored birds of the same species, by a Mr. A. F. Calder, of Charlottetown, P. E. I. The specimen is somewhat ashy-white about head and neck, gradually shading to white upon the tail and under parts. The white wing-bars are scarcely perceptible. The specimen is nicely preserved and is now in the possession of the writer.

Another rarity from P.E.I. is a little brown crane (*Grus Canadensis*) taken at Alexander. This bird was a young female, secured Sept. 22, 1905, and is now in museum of Colchester Academy, Truro, N. S. This is probably the only record of a bird of this species being taken east of Manitoba, except one secured in Greenland, as recorded by J. Macoun in his "Catalogue of Canadian Birds." Near Fredericton, N. B., a great gray owl (*Scotiaptex nebulosa*) was secured March 22, '06. This specimen was a beautiful female and measured twenty-six inches in length and an alar extent of sixty inches, yet its entire weight was only two pounds. The stomach and intestines were empty and the body was in an emaciated condition. The specimen is in the writer's collection.

WM. H. MOORE,
Scotch Lake, York Co., N.B.

NATURE STUDY No. XXXVI.

The Foundations of Chemistry as Seen in Nature Study. (For Teachers Especially.)

By John Brittain, Woodstock, N.B.

Chemical Union.

In order to teach effectively we must distinguish carefully between the trivial and the important—between the accidental and the essential. We are apt to spend too much of the precious school-time over the details which have little significance—the lifeless husks which enclose and conceal the living germ—thoughts. We think that we must do this in order to be thorough; but we deserve no credit for thoroughness in doing things which should not be done at all or which should be done elsewhere or at another time. Let us rather devote our skill and patience to the development, in natural and logical sequence, of the great facts and principles of nature and of life. Practice and the habit of observation will ensure a sufficient knowledge of details.

At the basis of all the natural forms we see—organic and inorganic—lies the fact of chemical union or combination. To learn to distinguish it, by its effects, from mere mechanical mixture, it is not necessary for the learners to wait until they have become acquainted with the molecular and atomic theories. Only very simple apparatus and cheap material are required for the experiments which follow.

Each member of the class is supplied with a small stick of *dry* white wood. The sticks are held for a few seconds in the flame of a spirit lamp. At once a soft black substance appears in the heated part of the stick—a substance which will mark on paper and which will be found to be insoluble in water. The pupils recognize this as charcoal which they may be told is a form of carbon. Now the question is, where was the charcoal before the stick was heated? We could not see it before that was done.

It will be found, by holding the hand above the flame of the lamp that no charcoal issues from *it*—nor does it come out of the surrounding air. Hence it must have been in the stick at first. But why did the charcoal not then make the stick black?

Heat slowly and carefully a little of the wood, cut into small pieces, in the bottom of a closed test-tube. Clear drops of a tasteless liquid like water form on the inside of the tube above the wood; and as the water gathers, the charcoal appears. The water evidently comes out of the dry wood and leaves the charcoal behind.

It can easily be shown, by means of a hand balance, that a piece of charcoal (from a stove) weighs less than a piece of the dry wood, equal in size, from which the charcoal was obtained.

It is plain then that *dry* white wood contains both charcoal and water, and that when the water is driven out by the heat, the charcoal can be seen. And so it appears that the water in the wood hides the charcoal, else the wood would look black, and the charcoal conceals the water, else the wood would feel wet.

It may now be stated that when two substances—as charcoal and water in this case—are so united together that they conceal each other's properties, the two substances are said to be chemically united or combined; and the substance they form by their union is called a chemical compound. Thus dry wood may be regarded as a chemical compound of carbon and water.

Next mix together, in a bottle, water and powdered charcoal. Do they unite chemically? They do not conceal each other's properties. The black charcoal can still be *seen* and the water *felt*. They now form, not a chemical compound, but a chemical or physical mixture. But how can the charcoal and water be got to unite chemically? They must have been chemically separate before they united to form wood; but *we* don't know, at present, how to compel them to combine to form wood.

Put finely divided wood, to the depth of about an inch, into a test-tube loosely closed with a cork or the thumb,—and apply heat until the tube is filled with smoky gas; then without withdrawing the heat remove the cork or thumb, and try with a match until you succeed, to set fire to the gas in the tube. How do you account for this combustible "wood-gas"? Since this gas will burn, it cannot be water-gas (steam); so we must conclude, since chemists find that pure wood is composed entirely of carbon and water, that this gas was formed in some way from these two substances in the wood. It should be noted here that the water set free by the heat soon becomes colored by some other liquid, and that a mass of charcoal remains in the tube after the water and the combustible gas has been all expelled. It will

be found upon trial that this charcoal residue, although it will not burn with a flame like the gas, will slowly burn away with a *glow* when held by a wire in the flame of the lamp.

It seems from this experiment that when wood is heated in a closed space, it breaks up into other substances besides charcoal and water. This will explain too in part, the manufacture of charcoal and wood alcohol by the destructive distillation of wood, that is by heating wood in closed vessels, and the production of coke (carbon) and coal gas from bituminous coal by destructive distillation.

Let the children char small samples of starch and sugar—try whether they contain water—and whether combustible gases are formed when they are decomposed by heat. The last experiment may be performed by heating a little starch and sugar in an iron spoon until they take fire. It will be seen that the solid substance does not burn, but the flame is a burning gas which rises from the solid matter. The starch and sugar are really being heated in a closed space, shut off from the air by the spoon below, and the burning gas above. In like manner, in the case of wood fire, we see that the flames are caused by the burning of the combustible gases, given off from the hot wood.

The children will now be able to describe the results of their experiments with sugar and starch and to state and justify their conclusions as to the composition of both. They will doubtless conclude that, like wood, starch and sugar are probably composed of charcoal and water chemically united. They may then be told that sugar, starch and wood and several other substances of similar composition, are called carbohydrates. The fitness of this name should be shown from its derivation.

In all this work, the teacher is supposed to act only as the director of experiments and as the referee in deciding the validity of the arguments and inferences. His skill is measured by the success he has had in inducing each pupil to do his own observing and thinking independently.

After a careful review of the whole ground, the children should retain a good working idea of chemical union—will see that heat tends to separate substances that have been chemically united—will understand what agricultural lecturers mean by carbohydrates—will know that when carbohydrates are heated in a closed place until they decompose they break up into carbon, water, and other substances liquid and gaseous—will see that

a flame is a burning gas and that a solid, as carbon, burns without a flame—and will be able to form an intelligent conception of many processes in nature and the arts which would otherwise be quite inexplicable.

The main topic in these lessons—for this work covers several lessons—is *chemical union*; but the other topics discussed are important and all of them help in making clearer the idea of chemical union. And this illustrates another method of making our teaching more effective and saving time in the process. I mean that while we keep in view one principal topic we should always associate it with others which are significant and worth teaching in themselves and at the same time are so related to the central topic that they can be used effectively in enforcing it.

OTTAWA SUMMER SCHOOL OF SCIENCE.

Last year a most successful and enjoyable three weeks' session Summer School was held at the Normal School, Ottawa, under the direction of Dr. J. F. White and Mr. J. H. Putman, assisted by Mr. A. E. Attwood and others. The school was well attended by teachers and other students to the number of 160.

We are glad to hear that it has been decided to hold a similar school this summer. The lectures will be given in the Normal school and in the field. The course will open on July 3 and last for three weeks. The arrangements have been handed over to Mr. J. H. Putman whose addresses were so acceptable to all in attendance last year. Mr. Putman will give an Elementary Course in Botany. Mr. A. E. Attwood will help in the field work and will lecture on Animal Biology and Mineralogy. Mr. F. E. Perney will give addresses on Physical Geography. Mr. J. F. Sullivan will help in the botanical field work. Mr. J. S. Harterre will have charge of the Manual Training classes and Miss Gallup of Sewing. Mr. J. A. Dobbie will take charge of the Art work. The course will embrace Nature Study, Domestic Science, Manual Training, Drawing and Colour Work.

In addition to the above, two lectures will be given on Insects and two on Birds, by Dr. Fletcher, and one on Fish and Fish-life by Prof. E. E. Prince.

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VOL. XX. OTTAWA, AUGUST, 1906. No. 5

THE SPECIES OF BOTRYOCRINUS.

By F. A. BATHER, British Museum (Nat. Hist.), London, S.W., England.

Twelve years have passed since the first publication of a statement that *Botryocrinus* occurs in America ('Crin. Gotland,' *Svensk. Vet.-Akad. Handl.*, XXV. No. 2, pp. 103-105; 1893. Although two of the determinations there made have been accepted by such well-known palaeontologists as Dr. J. F. Whiteaves and Dr. Stuart Weller, the facts appear to be still unrecognized by some American writers on fossil crinoids. It may therefore be useful to consider the generic position and the specific independence of the alleged American forms more fully than heretofore.

Comparison of the American species, rightly or wrongly referred to *Botryocrinus*, with the species found in Europe and Australia is rendered difficult by the fact that the diagnoses of the latter were based mainly on the characters of the arm-structure and partly on those of the stem-structure, whereas the former species are represented only by dorsal cups. It has, therefore, been necessary to re-study the dorsal cups of the European and Australian species and to prepare diagnoses founded on those elements alone. While the European and Australian species are not readily distinguished *inter se* upon these grounds, the dorsal cups of the American species fortunately present more points of difference.

My thanks are due to Dr. Whiteaves for kindly lending me the unique specimen of his *Homocrinus crassus*, of which a plaster cast is now preserved in the British Museum; also to Mr. F. Chapman of Melbourne for sending a wax squeeze of his *Botryocrinus longibrachiatus* to the same museum. A re-examination of this and other material contained in the British Museum has

greatly helped the revision of the diagnoses. I am further specially indebted to Professor H. C. Bumpus for the loan of the holotype of *Cyathocrinus nucleus*.

The contractions and symbols used in this paper are those adopted in Part III.—The Echinoderma—of "A Treatise on Zoology", edited by E. Ray Lankester (London, 1900; see p. 143). The terminology of the type-material follows the recent revision by C. Schuchert & S. S. Buckman (see *Science* [n s], XXI, p. 899; 9 June, 1905; Ann. Mag. Nat. Hist. [7], XVI, p. 102; July, 1905; and Introduction to 'Catalogue of the type and figured specimens of fossils .....' *Bull. U. S. National Mus*, LIII, Pt I; Sept. 1905). References to previous literature are confined to passages of systematic importance, and, for the sake of brevity, the plate and figure numbers are usually omitted.

SWEDISH SPECIES.

Botryocrinus ramosissimus.

Botryocrinus ramosissimus, Angelin, 1878, 'Iconogr. Crin. Suec.' p. 24.
Botryocrinus corallum, Angelin, 1878, op. cit. p. 24.
Botryocrinus ramosissimus, Bather, 1893, 'Crin. Gotland'. *Svensk Vet.-Akad. Handl.*, XXV, No. 2, p. 117.

Dorsal cup a wide cone, with straight sides, except for a slight projection of RR towards the facet. Height of cup (11. mm.), 100; width at base, 56; width at summit, 139. IBB and BB wider than high. RR not higher than wide. Arm-facet .63 of R. *x* supports 3 or more tube-plates. Proximal columnal obscurely pentagonal.

Lower Ludlovian, Lindström's bed *f*, Gotland.

Cotypes of *B. ramosissimus* and *B. corallum* in Riksmuseum, Stockholm. As lectotype of *B. ramosissimus*, should be taken the specimen lettered *b* (Crin. Gotland, p. 117).

Botryocrinus cucurbitaceus.

Sicyocrinus cucurbitaceus, Angelin, 1878, 'Iconogr. Crin. Suec'. p. 23, 24.
Botryocrinus cucurbitaceus, Bather, 1893, 'Crin. Gotland,' *Svensk. Vet.-Akad. Handl.* XXV, No. 2. p. 120. Et locc. ibi citt.

Dorsal cup a wide cone, with straight sides except for a very slight projection of RR towards the facet. Height of cup (5. 0

mm), 100 ; width at base, 50 ; width at summit, 118. IBB much wider than high. BB and RR about as high as wide. Arm-facet .62 of R. *x* supports 3 tube-plates. Proximal columnal pentagonal.

Lower Wenlockian, Lindström's bed *c*, Gotland

Of the two cotypes one is lost ; the other, which should be regarded as lectotype, is in Riksmuseum, Stockholm, lettered *a* (Crin. Gotland, p. 121).

BRITISH SPECIES.

Botryocrinus ramosus.

Botryocrinus ramosus, Bather, 1891, *Ann. Mag. Nat. Hist.* (6) VII, p. 394.

Dorsal cup incompletely known, apparently a wide cone, with plates slightly rounded and RR not conspicuously projecting. Height (? 10. mm), 100 ; width at base, ? 60 ; width at summit, 115. IBB uncertain. BB slightly higher than wide. RR wider than high. Arm-facet .9 of R. *x* supports one tube-plate. Proximal columnal unknown.

Upper Wenlockian, Upper Wenlock Limestone, Dudley.

Holotype in British Museum, No. 57217.

Botryocrinus decadactylus.

Cyathocrinus (sp. 2) *decadactylus*, Salter, 1873, 'Cat. Cambr. Sil. Foss. Cambridge,' p. 123.

Cyathocrinus (sp. 3) *quindecimalis*, Salter, 1873, op. cit., p. 124.

Botryocrinus decadactylus, Bather, 1891, *Ann. Mag. Nat. Hist.* (6) VII, p. 395.

Dorsal cup elegant, rapidly widening above in a concavo-convex curve. The plates show slight traces of axial folding, and RR project slightly. Height of cup (6.5 mm.), 100 ; width at base, 51 ; width at summit, 128. All plates wider than high. Arm-facet from .48 to .85 of R. *x* supports 3 tube-plates. Proximal columnal obscurely pentagonal.

Upper Wenlockian, Upper Wenlock Limestone, Dudley.

The specimens to which Salter attached his MS. names are in the Sedgwick Museum, Cambridge, England, numbered a 404 and a 405 respectively ; but since they do not show the characters even of the genus, it seems better to select from among

the numerous other specimens described by me, British Museum No. E1419 as lectotype, regarding the Cambridge specimens as chirotypes.

Botryocrinus pinnulatus.

Botryocrinus pinnulatus, Bather, 1891, *Ann. Mag. Nat. Hist.* (6), VII, p. 402 ; also 1892, ser. cit. IX p. 192.

Dorsal cup widens rapidly above with a concave curve. The plates show traces of axial folding, and RR project markedly. Height of cup (8.5 mm.), 100 ; width at base, 42-47 ; width at summit, 129. IBB wider than high. BB as high as wide. RR wider than high. Arm-facet less than .5 of R. *x* supports 3 tube-plates. Proximal columnal pentagonal or quinquelobate.

Upper Wenlockian, Upper or Thin Wenlock Limestone, Dudley.

Holotype in Dudley Museum. The heautotype of the second reference (supra) has recently been acquired for the British Museum (No. E 14081).

In the original description of the holotype the measurements of height of cup, and of width at its summit appear inconsistent with the figure, and it seems probable that they were interchanged.

Botryocrinus quinquelobus.

Cyathocrinus quinquangularis Phillips, Salter, 1875, 'Cat. Cambr. Sil. Foss. Cambridge,' p. 123.

Botryocrinus quinquelobus, Bather, 1892, *Ann. Mag. Nat. Hist.* (6), X, p. 189.

Dorsal cup elegant, widening above, with a slightly concavo-convex curve, RR projecting very slightly. Height of cup (6.25 mm.), 100 ; width at base, 48 ; width at summit, circa 160. IBB not higher than wide. BB and RR wider than high. Arm-facet about .66 of R. *x* unknown. Proximal columnal quinquelobate.

Upper Wenlockian, Upper Wenlock Limestone, Dudley.

Two cotypes in Sedgwick Museum, Cambridge, England, No. a 435. No. 1 of my description is hereby selected as lectotype.

AUSTRALIAN SPECIES

Botryocrinus longibrachiatus.

Botryocrinus longibrachiatus, F. Chapman, 1903, *Proc. R. Soc. Victoria* (n.s.) XV, p. 108.

Dorsal cup conical, with straight sides, the plates slightly rounded, RR projecting very slightly if at all. Height (7.2 mm), 100; width at base, 44; width at summit, 125. IBB and BB slightly higher than wide. RR about as high as wide. Arm-facet not more than .5 of R. *x* rather wide and apparently supporting 3 tube plates. Proximal columnal quinquelobate.

Silurian, Brunswick, Victoria.

Three cotypes in National Museum, Melbourne, No. 390–392. Of these, No. 390, shown in Chapman's pl. xviii, f. 6, should be taken as lectotype. Plastotype in British Museum, No. E7130.

The present diagnosis differs in some respects from the account given by Mr. Chapman, being based on the excellent wax squeeze which he so kindly sent. From this it appears that the plates were somewhat disarranged, and that the specimen was flattened, thus appearing wider above than it really was. Mr. Chapman only measured to half-millimetres, but measurement with sliding callipers and a vernier gives: Height, 7.2 mm.; width at base, 3.2 mm.; width at summit, 10 mm. In calculating the proportions for the diagnosis I have reduced the last measurement to 9 mm.; it may have been even less. Thus the proportions and form of the cup do not so closely resemble *B. quinquelobus* as would appear from the published figures. It was, Mr. Chapman has informed me, mainly this supposed resemblance which led him to refer the species to *Botryocrinus* notwithstanding the apparent invisibility in both species of structures definitely diagnostic of the genus. Examination of the wax squeeze, however, convinces me that those structures are after all to be seen in *B. longibrachiatus*. Chapman's pl. xviii, f. 6, is in fact viewed from the left posterior radius, l. post. R being the middle of the three plates in the uppermost circlet, the plate on its right hand being *x*, the plate below it on the right being post. B, and the small plate, of which a portion is seen to the right between post. B and *x*, being RA. The edge of r. post. R is seen to the right of *x*.

Mr. Chapman presumably interpreted *x*, which he nowhere mentions, as a radial ; but the present identification, when once made, is so obvious that only two facts need be adduced in its support. First, the heptagonal outline of the plate here called post. B. Second, the contrast between the conspicuous arm-facets on l. post. and l. ant. RR, and the absence of any such excavation on *x*. Above *x*, in the angle between it and the proximal IBr. of r. post. arm, are a few small plates (apparently not the ones alluded to and figured as tegminal plates by Mr. Chapman), and one of these seems to be folded at its edges as is so usual in the tube-plates of this genus. The arm-facet, neither mentioned nor very exactly drawn by Mr. Chapman, appears to have had straight, rather steeply sloping sides, ending in a deep axial canal, which has broken through to the front of the plate (compare the account of the ventral groove and axial canal in *B. crassus*). It is not easy to understand the true shape and proportions of the facet ; but the narrowness of the primibrachs indicates that its width can scarcely have been half that of the radial.

AMERICAN SPECIES.

Botryocrinus nucleus.

Dendrocrinus nucleus, Hall, 1876, *Rep. N. Y. State Mus. Nat. Hist.* XXVIII, Documentary Edit., explan. pl. xv, ff. 7-9.

Cyathocrinus nucleus, Hall, 1879, op. cit., Museum Edit., p. 136.

Homocrinus nucleus, Wachsmuth & Springer, 1886, 'Revision of Palaeocrinoidea', III, p. 220, *Proc. Acad. Nat. Sci. Philadelphia*, 1886, p. 144.

Botryocrinus nucleus, Bather, 1893, 'Crin. Gotland', *Svensk. Vet.-Akad. Handl.* XXV, No. 2, p. 104.

Dorsal cup with straight sides up to the RR. which project markedly towards the arm-facet. Slight trace of axial folding on BB. Height of cup (8-11.5 mm), 100 ; width at base, 43 ; width at summit, 125-130. IBB low, much wider than high. BB wider than high. RR higher than wide. Arm-facet more than .66 of R. *x* supports 1 tube-plate. Proximal columnal circular, with tendency to quinquelobation.

Upper Wenlockian, Niagara shales of Waldron, Ind.

Holotype, American Museum of Natural History, No. 1898. Plastotype in British Museum, No. E14075.

It should be noted that the holotype is a young specimen, and that, according to Hall, it, or at least the figures of it, "do not fairly represent the species." Therefore the specimens on which Hall based his diagnosis and description should be more important than the specimen figured. Unfortunately they are not to be found in the American Museum of Natural History, and I have had to rely on Hall's description and on the little holotype which Professor H. C. Bumpus most kindly entrusted to me for examination. Its chief measurements are: Height of cup to top of RR, 3.6 mm.; width at base, 1.7 mm; width at summit, 5 mm.

Neither the description nor the figures of Hall indicate distinctly that this species is a *Botryocrinus*; indeed he himself says that it is "a true *Cyathocrinus* in structure". Hall, however, as has been previously pointed out (Wachsmuth & Springer, 'Revision' I, p. 82; Bather, 'Brit. Foss. Crin. VIII, *Cyathocrinus*', *Ann. Mag. Nat. Hist.* (6), IX, p. 206; 1892), "extended the diagnosis of *Cyathocrinus* to include forms with a small quadrangular radianal". Such a plate is shown in Hall's fig. 7, but in the actual specimen it is so obscure that one looks for confirmatory evidence. If such a plate were present the posterior and right posterior basals would be heptagonal. Now Hall says of this species "subradial plates [i. e. basals] wider than high, three of them pentagonal [err. pro 'hexagonal'] and two heptagonal." Therefore there was a small quadrangular radianal. That the species is not a *Homocrinus* follows from the shape of anal *x*, which has a broadly excavate upper surface. The shape of the cup markedly resembles that of the Gotland species of *Botryocrinus*, and the geological age harmonises. There is therefore no reason to doubt the correctness of this reference.

Botryocrinus Polyxo.

Cyathocrinus Polyxo, Hall, 1863, *Trans. Albany Inst.* IV, p. 199. (Date of vol. 1864; author's edition issued 2 May, 1863.)

Homocrinus polyxo, Wachsmuth & Springer, 1886, 'Revision of Palaeocrinoidea', III, p. 220, *Proc. Acad. Nat. Sci. Philadelphia*, 1886, p. 144.

Botryocrinus polyxo, Bather, 1893, 'Crin. Gotland', *Svensk. Vet.-Akad. Handl*, XXV, No. 2, p. 105.

Botryocrinus polyxo, Weller, 1900, *Chicago Nat. Hist. Survey, Bulletin* IV, Part I, p. 66. Et locc. ibi citt.

Dorsal cup rather widely spreading upwards with concavo-convex curve ; plates with axial folds ; RR projecting markedly to the facet. Height of cup (19 7 mm.) 100 ; width at base, 48 ; width at summit, 132. Plates, especially IBB and RR, wider than high. Arm-facet .28 of R. *x*, which is very wide, supports 3 (or more ?) tube-plates. Proximal columnal quinquelobate ; IBB project beyond it.

Upper Wenlockian, Niagara shales of Waldron, Ind.

Four cotypes in American Museum of Natural History, No. 1897. These are said to be figured by Hall, *Rep. N. Y. State Mus. Nat. Hist.* XXVIII, pl. xv, ff. 10-17. But Hall there mentions five specimens. Which of them is missing ?

Since Dr. Stuart Weller has confirmed the reference of this species to *Botryocrinus*, it is unnecessary to argue the point. His description is but slightly modified from Hall's and is presumably based on the co-types, or at any rate on topotypes. But when he says that the somewhat rare specimens found in the dolomite of Bridgeport near Chicago "are indistinguishable from typical individuals from Waldron", it must be objected that his figure (pl. xiv, f. 12) by no means bears out this statement. The plates in this specimen are a little disarranged, and possibly have lost some of their outer form by solution ; but it is easy enough to see the following points of difference. The dorsal cup shows no sign of spreading upwards, but seems to have had straight sides. The absence of axial folds may possibly be due to solution ; but it is clear that the radials do not project towards the facet, which consequently has not the markedly oblique slope seen in the cotypes. Approximate proportions, based on the figure, are : height, 100 ; width at base, 45 ; width at summit, at most, 123. The plates are perhaps wider than high, but not nearly so much so as in the cotypes. The arm-facet, which appears shallow, and far from "indenting the plate to about one-fourth of its depth", is drawn as at least .46 the width of the radial. *x* does not appear at all wide ; and RA, which is here narrower, has its long axis passing upwards from right to left, whereas in all Hall's figures it passes upwards from left to right. In short, if there is a species of *Botryocrinus* to which one would have thought it impossible to refer

this figure, that species is *B. polyxo*. Dr. Weller may reasonably be asked for an explanation.*

Botryocrinus crassus.

Homocrinus crassus, Whiteaves, 1889, *Contrib. Canad. Pal.* I, p. 95.
Botryocrinus crassus, Bather, 1893, 'Crin. Gotland'. *Svensk. Vet.-Akad. Handl.*, XXV, No. 2, p. 103.
Botryocrinus crassus, Whiteaves, 1898, *Contrib. Canad. Pal.* I, p. 375.

Dorsal cup bell-shaped, inflated near base and slightly constricted near middle of BB. RR very slightly projecting towards the facet. Height of cup (14 mm), 100; width at base, 32; width at summit, 95. IBB wider than high. BB higher than wide. RR wider than high below, but less wide than high above. Arm-facet about .66 of R. *x* supports at least 3 tube-plates. Proximal columnal circular.

Middle Devonian, Hamilton Group, Thedford, Ont.

Holotype in Mus. Geol. Surv. Canada at Ottawa. Plastotype in British Museum, No. E14060.

Redescription of the holotype (following the order of Dr. Whiteaves' original description):—

Dorsal cup somewhat bell-shaped, rather broad and sharply inflated near the base, and very slightly constricted just about the middle of the basals. Height of dorsal cup, from lower margin of infrabasals to top of radial facet, 14 mm., to bottom of facet, 12.75 mm.; maximum width of cup, 13.4 mm.; width at base, 4.5 mm. Infrabasals (IBB) pentagonal, about one half the size of the basals, and wider than high. Basals (BB) moderately large, about equal in size to the anterior radials; higher than wide; the three anterior ones hexagonal, the two posterior ones heptagonal and truncated above. Radianal plate (RA) equal in size to the IBB, rhomboid (see measurements below) and resting obliquely between the two posterior BB, the right posterior radial, and the superior anal plate *x*. Radials (RR) pentagonal, outer surface nearly flat below, slightly raised in the middle, and above this

*Dr. Weller has been so generous with his help to me in the past, that on 6th Jan., 1806, I presumed to ask for the loan of material that would enable these doubts to be set at rest. Either my letter or his reply must have gone astray, and the publication of these remarks can no longer be delayed. 10th July, 1906.

truncated abruptly and obliquely by the facet for the arms, angle of facet with general side of cup being 135°. The facet is shallowly excavated with contour almost circular, but broader than high, width 4 mm.; height 3.1 mm.; axial canal small, ovate, marginal, its acutely pointed apex opening directly into the ventral groove, which forms an obtusely angular notch in the centre of the upper margin of the plate. Right and left posterior RR a little smaller than the rest. Superior anal plate *x* pentagonal, equal in size to the r. post. R. and facetted above for the reception of plates of tne anal tube (vide infra). Cup-plates thick ; all rounded towards the sutures, especially in the upper part of the cup ; outer surface apparently smooth, but where the test is well preserved, as on post B. and ant. R, are slight traces of shagreen ornament

Measurements in millimetres :—

	Height.	Width below.	Width above.	Length of suture between plates.
IBB.....	4.	2.5	5.	3.
l. ant. B..... ...	8.	5.4	7.	4.5
ant. R.....	6.5	7.	6.4	4.
to bottom of facet....	4.			
r. post. R.....	5.	5.4	4.75	4.
to bottom of facet	2.75			
anal *x*.....	4.8	4.7	3.75	l. side 4. r. " 2 6

Each of the sutures bounding RA is 3 mm. long, and the plate in each direction is 3.6 mm.

Relations of the species :—

The radials slope outwards towards the facet, in the way characteristic of *Botryocrinus*. The axial canal is quite distinct from the ventral groove, though not actually separated therefrom by stereom. The sides of the ventral groove slope inwards at a wide angle, and at the same time separate from one another, so that the communication between ventral groove and axial canal becomes wider. Right posterior radial has portions of 3 or 4 rather solid covering plates. The chief point of difference between *Homocrinus* and *Botryocrinus*, so far as the dorsal cup is concerned, lies in the number of plates supported by the anal plate *x*. These plates are not preserved, but one can see the facets for

them on the upper surface of the plate *x*. There is one small, deeply grooved facet in the middle, and another rather smaller immediately to the right of this. The right and left slopes of anal *x* have larger curved facets, of which that on the left still bears a fragment of the succeeding tube-plate. Two small similar facets are clear on the adjacent slope of left posterior radial and one at all events is to be made out on right posterior radial. These facets are surrounded by a slightly elevated rim, so that their size and position are well defined. The arrangement of the tube-plates of the proximal row must therefore have been very like that of *Botryocrinus ramosissimus*, as figured in 'Crinoidea of Gotland' I, pl. v, fig. 164.

Among all specimens of *Botryocrinus* hitherto examined, this is the only one in which the greatest width of the cup is less than the height. This fact and the bell-shape of the cup certainly warrant the retention of the species.

Botryocrinus americanus.

Botryocrinus americanus, R. R. Rowley, 1904, Greene's 'Contrib. Indiana Palaeont.', Part XVIII, p. 184, pl. lv, ff. 12-14.

Dorsal cup spreading out rapidly from the narrow column, then ascending with approximately straight sides; all plates somewhat tumid, especially BB, which have wart like prominences in their lower part. Height of cup (as drawn 8·1—8·6 mm.), 100; diameter of column (2.3 mm.) 27; width at bottom of BB and top of RR (circa. 9·5 mm.), 113. IBB low as seen from the side, but their length is greater than their width. BB higher than wide. RR (except perhaps the two posterior) slightly wider than high. Arm-facet more than .5 of R. Number of tube-plates supported by *x* uncertain. Proximal columnal circular.

Middle Devonian, Hamilton Group, near Charlestown, Ind.

Holotype in collection of G. K. Greene, New Albany, Ind.

Professor Rowley's clear description unfortunately omits a few details that would have helped to complete the present diagnosis.*

*Mr. Greene would, I am confident, have acceded to my request to borrow the holotype for examination; but, as I regret to learn from Prof. Rowley, illness has prevented him from attending to business for some months. 10th July, 1906.

The figures suggest that the arm-facet occupies the whole upper surface of the radial, but it is merely described as more than half the width. It might be possible to distinguish facets for tube-plates on the summit of *x*, though the phrase "its top suture on a line with the top of the radials" suggests that it only supported one plate. Though very different in shape from all other dorsal cups of *Botryocrinus*, there seems no reason to doubt Prof. Rowley's ascription of his species. After all, the characters are only an intensification of those noted in *B. crassus* from the same formation.

It should, however, be recalled that there exist other Palæozoic genera with the dorsal cup constructed as in *Botryocrinus*. The Devonian representative of such genera is *Cosmocrinus* (Jaekel, 1898, *Zeitschr. deutsch. geol. ges* , L, Protok. p. 28). *C. Holzapfeli* Jaekel, *Poteriocrinus dilatatus* Schultze, and *Cyathocrinus ornatissimus* Hall were referred to this genus by Dr. Jaekel, and of these the first should be made genolectotype. A good figure of the cup has been given only for *C. dilatatus*, and this, though marked with exceptionally strong axial folds, appears to have the characteristic *Botryocrinus* structure. Redescription of *C. ornatissimus* is much needed. At present it can only be said that, in the absence of direct evidence from the arms, there is no reason for referring any other American species to Cosmocrinus.

Cosmocrinus is a distinct side-branch of Devonian age, but perhaps the American Devonian fossils here referred to *Botryocrinus* represent a transition from that typically Silurian genus to the very similar Carboniferous *Barycrinus*. Protuberant basals, like those of *Botryocrinus americanus*, are seen in *Barycrinus stellatus*, *B. bullatus*, *B. subtumidus*, *B. mammatus*, and others. Perhaps indeed *Botryocrinus americanus* is really a *Barycrinus*. And perhaps *Botryocrinus* itself should be merged in that genus. Fifteen years have passed since I expressed my inability to distinguish between *Botryocrinus*, *Barycrinus*, and *Vasocrinus*, and since I "thought it better simply to describe the long-known genus *Botryocrinus* as fully as possible, with the aid of new material, and to leave to the American palæontologists the task of comparing it afresh with these other more particularly American genera." All that American palæontologists have done in the matter since then has been to accept without discussion my reference of certain American species to *Botryocrinus*. May we not hope for an independent study of this question from one of the many careful workers who are now turning their attention to the fossil crinoids of North America?

SOME NEW PLANTS FROM THE CANADIAN ROCKIES AND SELKIRKS.

EDITH M. FARR.

In the summer of 1904 I collected specimens of a *Pachystima* which proved upon examination to be a hitherto undescribed species and was given the name of *P. macrophyllum*. It was found in fruit at Bear Creek Station in the Selkirks while the more usual form, *P. Myrsinites*, was collected in flower in the month of May, at Cedar Creek, in the same range of mountains. In order to complete the study of these forms it was necessary to secure specimens of *P. macrophyllum*, in flower, and of *P. Myrsinites* in fruit. Accordingly a special effort to that end was made this past summer when the region of the Selkirk Mts. was again visited. *P. macrophyllum* was obtained in full flower at Bear Creek Station on the twenty-fifth of May, *P. Myrsinites* in flower at Six Mile Creek on the eighteenth of May, and at Glacier on the twenty-sixth of the same month. During the first week in August *P. Myrsinites* was found in fruit at Glacier so that the two forms were then complete.

In general appearance the two differ widely, and this is especially evident when they are both seen at the same season of the year. As stated in the paper published in November, 1904, in the "Contributions from the Botanical Laboratory of the University of Pennsylvania," *P. Myrsinites* is of compact habit, the branches being erect and stiff, the leaves arranged in a decussate manner, giving a bushy appearance to the shrub. Further, the entire plant has a yellowish tone, while the leaves are thicker and more rounded than in *P. macrophyllum*. *P. macrophyllum* is of a loosely spreading habit, the branches being somewhat drooping and graceful, the leaves spreading in such a manner as to give a 2-ranked, flattened appearance to the branches. This species has a bright, almost bluish green tone as compared with *P. Myrsinites*, and the leaves are, as a rule, three to five times as long as broad.

Still another form was collected at Bear Creek Station, the same locality in which *P. macrophyllum* has been found. This plant was collected by Mrs. Charles Schäffer, and I take the

liberty of naming it in honor of the late Dr. Charles Schäffer of Philadelphia, who spent many summers in this region and was much interested in the flora of the Canadian Rockies and Selkirks.

Specimens collected by Mr. Louis Krautter at Black Butte, Siskiyou Co., California, differ markedly in certain respects from those already mentioned, and are, I think, worthy of being assigned to a separate species. I have therefore described them under the name *P. Krautteri.*

The distinguishing points in the above named species may be mentioned as follows :—

In *P. Schaefferi* and *P. macrophyllum*, the habit is loosely spreading with the leaves borne in one plane while in *P. Myrsinites*, the habit is compact and rigid with the leaves spreading in a decussate fashion ; the habit of *P. Krautteri*, is somewhat intermediate, the leaves closely ascending, but in one plane only. The internodes in *P. Myrsinities* are on an average much shorter than in *P. macrophyllum*, while in *P. Schaefferi* they are extremely variable although seldom surpassing the shortest in *P. macrophyllum* ; in *P. Krautteri* they vary slightly and are intermediate between *P. Myrsinites* and *P. macrophyllum.* In *P. Myrsinites* the petioles are suddenly contracted into the midrib, in *P. macrophyllum* and *P. Krautteri*, the petioles are swollen and this swelling is frequently continued into the midrib.

The four forms vary strikingly in the shape, size, veining, texture and color of the leaves.

P. Myrsinites and *P. Schaefferi* produce an abundance of flowers but comparatively few are found on *P. macrophyllum* and *P. Krautteri.* The sepals and petals are more elongated in *P. macrophyllum* than in *P. Myrsinites* while the filaments of the latter are much longer in proportion to the length of the anthers. The style of *P. macrophyllum* and of *P. Krautteri* is rather slender and the stigma slightly bilobed; in *P. Schaefferi*, the stigma is strongly bilobed ; and in *P. Myrsinites* the style is stout and the stigma rounded. In both *P. Myrsinites* and *P. macrophyllum* very little fruit is produced. This is especially striking in *P. Myrsinites* where the flowers occur in great profusion. *P. Schaefferi* and *P. Krautteri* have not been seen in fruit.

In *P. macrophyllum* the flowers are very markedly pro-

tandrous. In all the forms the color of the flowers is similar, a brick red, but in *P. macrophyllum* it is rather deeper in shade than in the other species.

Following are descriptions not only of those species hitherto undescribed but also of *P. Myrsinites* and of *P. macrophyllum*

Pachystima Myrsinites, sp. nov.

Twigs short, dense, radiate, sienna brown with 4 narrow dark ridges, the internodes 6-10 mm. long, the leaves densely and decussately spreading, nearly sessile or shortly petiolate, the petioles suddenly contracted beneath into the flat midrib, lamina sub-rotund to oval and elliptic, the veins very obscure in 3-4 pairs, radiating, the margin dentate, teeth not incurved, thickened and revolute below, thinning out above, yellowish-green above and below, thick, opaque.

Flowers odorless, very numerous, densely clustered in fascicles of 5-6, rarely 3-4, on arrested, bi-bracteolate branches springing from axils of foliage leaves; sepals broadly oval, the midrib faint or absent, apex rounded; petals oval to ovate, nearly as broad as long; stamens 4, inserted into a quadrate disc, filaments twice the length of the anthers; flowers slightly protandrous to gyno-monoecious; style short, thick, stigma rounded. Fruit scanty.

Pachystima macrophyllum, sp. nov.

Twigs elongate, loosely spreading in one plane, cinnamon brown, longitudinally 4-ridged, the ridges dark brown, the internodes 10-20, usually 15 mm. long, the leaves arranged in one plane and springing from between the stem ridges, shortly petiolate, the petioles gradually contracted into the leaf midrib, lamina oval-elliptic to oblanceolate, the veins evident, in six pairs, longitudinally oblique, the margin incurved-toothed from near the middle upwards, strongly thickened and revolute, glaucous green above, bright green below, translucent.

Flowers few, in fascicles of 2-3, sometimes 1, on short branches in axils of foliage leaves; sepals ovate, contracted at base, the midrib usually prominent, the margins slightly toothed, apex pointed; petals broadly ovate, twice longer than broad, finely but irregularly toothed along upper margins, apex rounded; stamens 4, inserted into a quadrately circular disc, filaments and

anthers of equal length ; flowers protandrous, the ovary sunk in the disc ; style rather slender, at first short, later elongated, stigma slightly bilobed. Fruit scanty.

Pachystima Schaefferi, sp. nov.

Twigs spreading as in *P. macrophyllum*, but the color and ridges approaching *P. Myrsinites*, the internodes very variable, from 2-10 mm. long, the leaves in one plane, shortly petiolate, the petioles slightly swollen, the bladdery swelling often prolonged into the midrib, lamina lanceolate to linear-lanceolate, the veins evident, in 6-7 pairs, intermediate in position between *P. Myrsinites* and *P. macrophyllum*, the margin blunt-toothed from the middle upwards, slightly thickened, not revolute, bright green above and below, translucent.

Flowers agreeably odorous, very numerous, in short clusters of 2-5, on slightly elongated branches ; sepals and petals as in *P. macrophyllum ;* stamens 4, inserted into a quadrate disc ; filaments one and one-half to two times longer than anthers ; style rather thin, stigma strongly bilobed.

Pachystima Krautteri, sp. nov.

Twigs elongate, closely spreading in one plane, grayish-brown, the internodes 9-11 mm. long, the leaves rather crowded, closely ascending in one plane, shortly petiolate, the petioles gradually attenuate into the midrib, lamina elliptic to elliptic-lanceolate, the veins evident below, obscure above, in 4-5 pairs, obliquely radiating, the margins strongly and sharply dentate in the upper half, thickened and revolute, bright yellowish-green, rather thick, almost opaque.

Flowers few, in clusters of 1-3, on short branches, sepals ovate-deltoid, midrib not discernible, the margins entire, or nearly so, petals not seen, stamens 4, disc as in *P. macrophyllum*, style rather slender, with slightly enlarged, faintly bilobed stigma. Fruit not seen.

The following new species were also collected during the summer of 1905. The type specimens of these, as well as of those of *Pachystima Schaefferi* and *P. Krautteri* are in the Herbarium of the University of Pennsylvania.

Arnica Louiseana, sp. nov.

Plant 7-20 cm. high, slender, pubescent. Leaves in about three pairs, the two lowest at base of stem, the lowest pair 2-4 cm. long, elliptical to obovate, on short winged petioles, mostly entire, the second pair 4-6 cm. long, elliptical, sessile, sparingly and saliently denticulate, the uppermost pair usually much smaller, narrowly ovate to lanceolate, entire or denticulate, all slightly glandular on both surfaces, the margins sparingly glandular and bearing a few long white hairs, fragrant.

Heads of flowers 1-3, usually 3, fragrant, 4 cm. broad, borne on long, slender, nodding, pubescent peduncles, the hairs interspersed with glands; ray and disc flowers light yellow, rays 8-10, 12-14 mm. long. Involucre 1 cm. high, campanulate, densely glandular villous at base, brownish-purple, the bracts lanceolate, acute, bearing scattered white hairs especially towards the apex, uniseriate, equal.

Receptacle slightly convex; achenes linear, strongly striate, brownish-black with a few short, scattered, white hairs; pappus white.

This species is perhaps more closely related to *A. Lessingii*, Greene, than to any other, but is a much smaller plant. The margins of the leaves are slightly glandular-ciliate while in *A. Lessingii* they are strongly pubescent.

It has usually three heads instead of one only as in that species; the bracts of the involucre uniseriate instead of biseriate, glandular and villous at base instead of pubescent. The rays are about half the length of those in *A. Lessingii*. The pale yellow color of the flowers and their drooping tendency distinguish it from other *Arnicas* of the region. It was found growing among the loose rocks on the slopes of Mt. Fairview, at Lake Louise in the Canadian Rocky Mts.

Hieracium Albertinum, sp. nov.

25-50 cm. high, the stem villous throughout with long, rigid, white hairs arising from black papillæ.

Leaves 5-12 cm. long, narrowly elliptical, tapering at both ends, the upper sessile, the lower narrowed into margined petioles.

Heads about 2 cm. broad, numerous in a paniculate raceme, light yellow. Involucre 12 mm. high, conspicuously clothed with long, soft, white hairs, bracts linear, mainly in one series

Achenes oblong, striate, dark brown; pappus tawny.

Hieracium Albertinum, was collected on the fourteenth of August, 1905. It was found growing abundantly with *Eriogonum subalpinum*, Greene, *Silene Lyallii*, Watson, and *Heuchera ovalifolia*, Nutt., on a grassy slope above the trail between Lake Louise and Moraine Lake. The long white hairs with which the plant is so profusely covered give it a silvery appearance which is very striking and typical.

Dryas tomentosa, sp. nov.

Similar to *D. Drummondii*, Richards, but the leaves covered on both surfaces with a thick white tomentum, giving them a pale gray color above and white beneath; the petioles rather stout, clothed with white floccose pubescence. The yellow flowers are borne on stout floccose-pubescent scapes. The sepals are densely glandular with purplish-black stalked glands.

This interesting form of *Dryas* was collected near the summit of the Pass leading from Emerald Lake into the Yoho Valley, at an altitude probably of 5500 feet. It was growing in patches with *Drummondii*, with which it did not seem to intergrade, but preserved its own individuality.

Ranunculus apetalus, sp. nov.

Slender, 25-37 cm. high, villous with scattered hairs, becoming glabrate below.

Leaves 18-50 mm. broad, the basal orbicular to cordate in outline, from deeply crenate to 5-9-lobed or divided, the divisions cuneate and irregularly lobed, petioled; the cauline divided to the base, the cuneate divisions deeply and variously incised; sessile, clothed with loosely matted hairs or the lower glabrous, gray green.

Flowers several, about 1 cm. broad, borne on long peduncles. Sepals 5, very concave, sub-orbicular, villous on the exterior, the margins often petaloid, yellowish-green. Petals wanting.

Head of fruit oblong to ovoid. Achenes inflated, compressed

laterally, not angled, pubescent, tipped with the minute decurved style, 1-ovuled, maturing very irregularly.

This *Ranunculus* closely resembles *R. affinis*, R. Br. *var. validus*, Gray, in the heterophyllous character of the leaves, but these are not succulent as they are said to be in that variety. No trace of petals can be discerned in bud, half open flower or fully matured bloom; but the sepals have a decidedly petaloid appearance owing to the margins being quite yellow and glabrous.

It was found growing by the roadsides at Banff, Alberta.

RICHARDSON'S MERLIN.

I notice that very little reference is made in the "Catalogue of Canadian Birds" in connection with the nesting habits of Richardson's merlin, and think, perhaps, it would not be out of place for me to give my own experience of this bird while spending the summer of 1904 at Lethbridge, Alberta.

During the first week of May, 1904, I observed several pairs of these birds in the poplars that abound in the bottoms of the Belly River. I thought at the time that they were pigeon hawks, and that they were probably nesting in natural cavities in trees; but events proved otherwise.

On May 7th I made another visit to the locality where one pair was seen and was surprised at not being greeted with the usual harsh and scolding cries of the birds. Everything being quiet, I thought they had left the district or had been shot. While passing underneath a dilapidated magpie's nest, which was placed some 7 feet overhead in a scrubby poplar, I was surprised to see the female merlin flush from the same. The nest contained a pretty set of five eggs, which were simply laid on crumpled mud. The eggs are of a dark reddish brown color, resembling the duck hawk's eggs, being, of course, much smaller. The male bird came over from some of the adjacent poplars and the pair became pugnacious, sometimes darting within a foot of one's head, and uttering harsh cackling cries.

During the next two weeks I located three other magpies' nests containing full sets of this bird, the merlins in every instance being very noisy and wicked.

During the first week in June I took a beautiful second set of five eggs of this bird. This clutch was laid in the deserted nest of the American roughlegged hawk, which was placed about 60 feet up in a large poplar. This set is blotched with cinnamon color, not being of a general wash like the other sets. The pigment no doubt gave out in this case.

I am confident that these birds were just breeding locally, as they were not observed anywhere else. The many magpies' nests in the vicinity of Lethbridge seem to attract the birds, although I saw a pair of merlins looking after an old crow's nest, but was unable to visit the spot again.

To clinch the matter of identification I forwarded a set of these eggs to Mr. Walter Raine, of Toronto, and another to Mr. E. Arnold, of Battle Creek, Mich., and both gentlemen agree that the eggs are none other than Richardson's merlin.

W. J. BROWN.

Westmount, Que., July 10th, 1906.

THE GOLDEN WINGED WARBLER IN MANITOBA.

While watching a small lot of warblers in thickish woods on the morning of May 22nd I noted an unusual one among them which on close inspection proved to be a male golden-winged warbler (*Helmenthophila chrysoptera*) in full plumage. Numerous Magnolia warblers, redstarts and a few others were with it. This—so far as I am aware—is the second record of this bird appearing in Manitoba, the other having been taken by Mr. W. Hine, near Winnipeg about the 27th day of May, 1887—See Catalogue of Canadian Birds, part III., page 583, and *The Auk*, Vol. VII., page 404.

NORMAN CRIDDLE.

Aweme, Manitoba.

CORRESPONDENCE.

The Editor OTTAWA NATURALIST :

DEAR SIR,—In the last issue of *The Auk* Rev. G. W. G. Eitrig notes a peculiar fact about the field sparrow. "That it is found in the fall migration in Ottawa but that apparently nothing is recorded of its summer home to the north nor of its spring migration." As bearing on this subject I might say that I found single specimens of this bird in song on August 31, 1905 and July 27, 1899, at Kazuabazua, on the blueberry barrens, and on August 7, 1899, I recorded two in song near Ottawa, but have no memo. of the exact locality. The fact of the bird being there in full song at midsummer is practically as good a proof of its summer residence as if the nest and eggs were actually found. There is a good deal of the country north of Ottawa where the original forest has been destroyed which has now been given up to blueberry and to sweet fern, and I should think it likely that the field sparrows would occur all through this country where these conditions obtain. Ottawa is by no means the only place which shows erratic distribution of this species. In London it is very common and equally so at Toronto but in Guelph there is not a single record, and I am not sure but that this condition applies to the whole of Wellington county in which Guelph is situated, yet the bird is found much further north in western Ontario. It does not seem that there is any lack of suitable ground in the Guelph region. A raspberry thicket on the edge of a field or hazel or thorn bushes in an half open woods are its usual habitat and these combinations occur all over the country.

W. E. SAUNDERS.

London, Ont., July 18th, 1906.

REVIEW.

MOUNTAIN WILD FLOWERS OF CANADA. A SIMPLE AND POPULAR GUIDE TO THE NAMES AND DESCRIPTIONS OF THE FLOWERS THAT BLOOM ABOVE THE CLOUDS By Julia Henshaw, Toronto, William Briggs, 1906, pp. 384.

When a book on Canadian wild flowers is prefaced by letters of endorsation from Prof. Macoun and Dr. Fletcher, its excellence may be taken for granted, but the most hurried glance through "Mountain Wild Flowers of Canada" is sufficient to stamp it the finest work of its kind that has been published in America. The hundred full page half-tones reproduced from the best of many hundred photographs of mountain flowers taken by the author are in themselves worth far more than the price of the book. But to one who knows and loves mountain flowers the chief value of Mrs. Henshaw's work lies in the record of her own notes and observations which follow the technical description of each species. Many of the illustrations represent species which have not before been figured, but descriptions and illustrations while they make a book useful and attractive cannot compare in value with the record in simple beautiful language of the results of many years study of the growing plants. What Mrs. Trail has done for the wild flowers of eastern Canada, Mrs. Henshaw is doing for the west and they stand alone.

Intended primarily as a help to the tourist or botanist who is not familiar with alpine flowers, "Mountain Wild Flowers of Canada" is in the attractiveness of its illustrations and the poetic beauty of the author's notes so far beyond any other popular botanical work that no lover of nature can afford to be without it A few sentences extracted from the preface will indicate Mrs. Henshaw's style: "Who can adequately describe the luxuriant profusion of these alpine meadows? Who can tell in mere words of the glory and the glamour of such a scene? All around one the dazzling peaks in their frozen and pitiless beauty point long slender fingers up to God; cruel crevases split the gigantic rocks from tree-less top to pine-clad base where glaciers cling to the cliff with sparkling tentacles, and lichened stone-slopes are graciously clothed by the creeping juniper, and the pale green of Lyall's larches.

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VOL. XX. OTTAWA, SEPTEMBER, 1906. No. 6

NOTES ON SOME LAND AND FRESH WATER SHELLS FROM BRITISH COLUMBIA.

By J. F. WHITEAVES.

(A.) *From the vicinity of the International Boundary, on and between the Similkameen River and the Sumas Lake and Prairie; collected by J. M. Macoun and W. Spreadborough in 1905.*

The specimens referred to in this list were collected by Mr. Macoun in his capacity as Naturalist to the International Boundary Commission, or by Mr. Spreadborough, who was his assistant.

Although the region that they collected in is part of the country traversed by Mr. J. K. Lord, when naturalist to a similar commission in 1860, no specimens of *Limnæa Sumassi*, Baird, or of *Physa Lordi*, Baird, were detected or recognized in any of their collections. In the case of the *Physa*, the water at the typical locality for it (Lake Osoyoos) was so high when Mr. Macoun and his colleague visited it, in June, that no fresh water shells of any kind were obtained there. And, in this connection it may be mentioned that good specimens of the large *Physa* from Meach's Lake, near Chelsea, that were long thought to be either *P. Lordi*, or a large form of *P. ancillaria*, have recently been examined by Dr. Dall and pronounced to be the latter. "These shells," he writes, in a letter dated May 11th, 1906, "according to Tryon and Haldeman, are typical *Physa ancillaria*, Say, except that they are larger than usual. One of the middle sized specimens exactly agrees with Tryon's figure."

The species with an asterisk prefixed to their names were kindly determined by Dr. V. Sterki.

PELECYPODA.

Anodonta Oregonensis, Lea. (1838).

Anodonta cognata, Gould, 1850.

Small lake at Hope, and Sumas Lake, W. Spreadborough; several living and adult shells from each of these localities.

Sphœrium tumidum, Baird.

Sumas Lake, W. Spreadborough; a fine series of living specimens, in all stages of growth. This is the typical and only known locality for this well defined species.

**Sphœrium (Musculium) Raymondi*? J. G. Cooper.

Sumas Prairie, W. Spreadborough, several specimens, most of which are very immature. Specimens similar to the larger ones, in the Museum of the Geological Survey of Canada, were collected at ponds between Quesnel and Stewart lakes, by the late Dr. A. R. C. Selwyn in 1875.

**Pisidium proximum*, Sterki.

Second summit west of the Skagit River, in a small pond at an altitude of 6,000 feet, W. Spreadborough; many fine and adult living specimens.

**Pisidium Streatori*, Sterki. Var.

Third summit west of the Skagit River, in a small pond at an altitude of 6,000 feet, W. Spreadborough; nineteen specimens.

**Pisidium variabile*? Prime.

Sumas Prairie, W. Spreadborough; six specimens.

Pisidium, sp. undetermined.

Peat bog near the Skagit River, J. M. Macoun; eight specimens.

Pisidium, sp. undetermined.

In a marsh, Lake House, Skagit River, J. M. Macoun; sixteen specimens.

GASTEROPODA.

Limnæa palustris, Muller.

Similkameen River, J. M. Macoun; five specimens.

Limnæa desidiosa, Say. (Teste Dall.)

Sumas Prairie, W. Spreadborough ; many specimens.

Limnæa Vahlii? (Beck) Moller. Young.
Or *L. lepida*, Gould, young. Dall.

Sumas Prairie, W. Spreadborough ; twelve specimens.

Planorbis (Pierosoma) trivolvis? Say.

Sumas Prairie, and small lake at Hope, W. Spreadborough ; several immature specimens from each of these localities. These specimens are probably referable to *P. trivolvis*, but they may be young shells of *P. Binneyi*, Tryon.

Planorbis (Menetus) opercularis, Gould.

Sumas Prairie, W. Spreadborough ; several specimens.

Planorbis (Menetus) opercularis, Gould,
var. *Centervillensis*, Tryon. Teste Dall.

Peat bog near the Skagit River, J. M. Macoun ; four specimens.

Planorbis (Torquis) vermicularis, Gould.

Marsh near Lake House, on the Skagit River, J. M. Macoun ; several living specimens.

Physa propinqua, Tryon.

Sumas Prairie, W. Spreadborough, seven specimens ; and Similkameen River, J. M. Macoun, six specimens. This is the *Physa heterostropha* of Baird, but apparently not of Say.

Physa gyrina, Say. Teste Dall.

Sumas Prairie, W. Spreadborough ; several specimens.

Physa Nuttalli, Lea. Teste Dall.

Sumas Prairie, W. Spreadborough ; thirteen specimens.

Zonitoides arboreus (Say).

Peat bog near the Skagit River, J. M. Macoun ; five specimens.

Euconulus fulvus (Draparnaud).

Peat bog near the Skagit River, J. M. Macoun ; one specimen.

Succinea Hawkinsi, Baird.

East bank of the Similkameen River, J. M. Macoun ; four rather small but living specimens.

Succinea retusa, Lea.

Sumas Prairie, W. Spreadborough ; several specimens. In the Museum of the Geological Survey there are similar specimens from Deer Park, B.C , at an altitude of 5,300 feet, collected by Professor Macoun in 1890.

(B.) *From Douglas, B.C., collected by W. Spreadborough in May, 1906.*

PELECYPODA.

Margaritana margaritifera (L).

Campbell's Creek ; four perfect but rather small specimens.

**Pisidium* "*abditum*," or near.

Several specimens.

GASTEROPODA.

Planorbis (Menetus) opercularis,
var. *Centervillensis*.

Several specimens.

Polygyra Columbiana (Lea).

Two living and adult specimens.

Circinaria Vancouverensis (Lea).

One fine adult and living specimen.

(C.) *From various localities and collections.*

PELECYPODA.

Gonidea angulata (Lea).

Anodonta angulata, Lea. 1838.

This species has been recorded from British Columbia by Simpson and Dall, presumably because it is included in one of the lists of shells collected in that province by J. K. Lord in 1860. But, Mr. Lord's specimens are expressly stated to be from the Columbia River at Fort Colville, which, he says, is "not strictly

in British Columbia." It is not included in the Rev. G. W. Taylor's "Preliminary Catalogue of the Marine Mollusca of the Pacific Coast of Canada, with notes upon their distribution," in the Transactions of the Royal Society of Canada for 1895, though this paper gives a list of the land and fresh water, as well as of the marine shells of British Columbia, and quite recently Dr. Dall writes that he can find no specific record of *Gonidea* from that province in the United States National Museum.

In March, 1906, however, two dead but characteristic and separate valves, of shells that, in the writer's judgment, are clearly referable to this species, were presented to the Museum of the Geological Survey, by Mr. G. E. Winkler, of Penticton, who writes that he had recently found them "in the Okanagan River, near where it leaves Okanagan Lake, at Penticton." And, still more recently, in August last, he has collected and kindly forwarded, four perfect and adult, living but otherwise similar shells, from the same locality. This would seem to be the first definitely Canadian record for this well known California and Idaho species.

Pisidium Idahoense, Roper.

In the Museum of the Geological Survey there are two specimens, one perfect one and a single valve, of this species, which were collected at Fort George, "at the confluence of the Fraser and Nechacco rivers, B. C.," by Dr. G. M. Dawson in 1875. This is a previously unrecorded locality for this apparently rather rare species.

GASTEROPODA.

Polygyra ptychophora (Brown).

Helix ptychophora, A. D. Brown, 1870.

In the same museum there are a few good specimens of this species, from the following localities in British Columbia. Elk River, in the Crow's Nest Pass, collected by J. B. Tyrrell in 1883; Sproat, collected by Professor Macoun in 1890; and Trail, collected by W. Spreadborough in 1902.

Dr. Dall writes that similar specimens from Mission Junction (43 miles east of Vancouver, on the main line of the Canadian Pacific Railway) have recently been received at the United States National Museum.

EXTRACTS FROM THE DIARY OF THE LATE ROBT. ELLIOTT.

(Continued from Vol XIX p. 178.)

Aug. 17. At edge of wood opposite Mossey Cup Island I found in a small rotten stub, nest of flying squirrel; the female and four young about half grown. Nest five feet from ground in abandoned woodpecker's or blue-bird's hole, filled with fine bark strips. The mother came out, passed to top of stub and descended to foot of nearest tree. While I was examining young she came close to hole but again crawled to the top and passed away as before.

Aug. 29. Examined stomach of racoon; killed about 10 P.M. in corn patch. Contents 2-3 green corn, 1-3 insects, chiefly black beetles, but some red-legged locusts. In addition there was about 30 white worms, round, thickness of a knitting needle and about 1 1-2 to 2 inches long. Preserved three. Order Rematoidea.

Sept. 1. Fine, cloudless day. Saw alighting on dry, ploughed ground about sixty golden plover. When they rose and circled many times in the air, each time rising higher, they formed an exceedingly beautiful sight, especially when in turning, the sun was reflected in metallic opalescence.

Sept. 13. Found *Botrychium lunarioides*, perhaps var. *obliquum*, at Gough's. The Plover Mills *Veronica* is probably *V. agrostis* but Gray says it is one to two seeded while this is eight to twelve.

Nov. 14. At Foster's saw six grouse, one woodcock and one quail. The last named is now quite scarce in this neighborhood. Mr. F. gave me one egg of whippoorwill which he found in leafy woods in June. There was another one which he left. This one has rather small lavender spots upon a white ground. It is somewhat abnormal on account of the spots.

Dec. 15. The bird shot by Mr. A. Ralph, of sixth concession, London Township about Nov. 15th last is very probably the blue goose, *Chen caerulescens* (Linn). This is important and must not be overlooked.

Jany. 3, 1899. R. James and Jos. Smith heard one frog in swamp today. Very mild. I looked a great many places, under rotten logs, etc. for salamanders but found no traces of them.

Jany. 8. Picked off a thorn tree remains of a vole, probably left there by northern shrike.

Jany. 24. Hoar frost. Very warm today. Saw one light colored shore lark on the road (First).

Jany. 31. H. Karm, near Embro, in chopping a hollow tree came across eleven coons (*Procyon lotor*) in the interior; eight were killed, three escaping.

March 8. Saw J. W. digging two skunks out of a burrow in sandy soil, in open woods near river. They were in a nest of dry leaves about 2 1-2 feet from surface, male and female—the latter smaller and fatter than the other. Examined the stomachs; that of the male contained two or three withered leaves, and mixed with them, hairs of (probably) voles. There were also a large number of worms, parasites, numerous very small ones, and half dozen or so larger ones, one inch long. The female's stomach contained nothing but numerous small worms in mucous. W. told me that the greatest number of skunks he ever found in a burrow was eleven; but said that a man he knew once ran a fox into a hole and on setting a trap at the mouth he caught fifteen full grown skunks in as many consecutive nights and on the sixteenth he caught the fox. W. also stated that at one time during winter he dug a skunk out of a nest and found a woodchuck close beside it in a nest of its own. The latter was curled up and in a state of torpor, it awoke on the snow.

March 18. Saw a redtailed hawk and tiger beetle. Is the water bear (*Tardigrada*) really a depauperate arachnidium? Saw caddis fly larva for first time in same pool with *Branchippus stagnalis*. Pickering's tree toad croaking in pools for first.

March 19. Many Pickering's tree toads out. Saw two small garter snakes on dry knoll at edge of pool. Saw the first Camberwell beauty at edge of woods.

March 21. Saw a white-footed mouse in hole (natural scar) of small green beech. Nest of thistledown. A large mass of shelled beechnuts were lying at foot of tree. The margin of

the hole on the outside was partly eaten away by (I believe) some larger mammal; probably to get at the little white-foot It was quite tame but would bite a little at a twig inserted and once struck at it with its front feet.

March 25. At Model. *Skunk cabbage in full bloom. The spathe is shell-like and very pretty, being variously streaked with purple and yellow. The whole plant has a strong skunk-like odor, no doubt a defense to the large tender plant in the struggle for life in places overrun by herbivorous animals. The blossom precedes the leaves and is very early—the only available time the plant has found to catch the eye of the fertilizing bees.

March 28. Froze hard last night. Slight snow fall, quite cold A. M. Birds hard put. P.M. sun out, snow melted.

April 1. Five or six inches of snow. Winter once more. Birds are surely hard put.

April 3. Cloudy and mild. Snow disappearing. Saw four or five killdeer running at a creek edge querulously calling.

April 4. Froze hard last night, rather mild today. Saw at edge of muddy road what I took to be a Wilson snipe, although apparently rather small. It lit on a rail fence and allowed me to approach within thirty-five yards, then flew with the irregular snipe-flight, and at the moment of rising uttered a characteristic bleat.

April 5. Fine, A. M. Vesper sparrow singing for first time, Saw phoebe at Crozier's Creek. P.M. Snowing heavily, and high wind from north. As I rode fifteen miles in the teeth of the storm I had a clearer view of the struggle for existence.

April 6. Snow 6 inches deep on the level and high drifts beside. All this snow fell since yesterday noon. This morning is calm and mild with a strong sun shining, and no doubt, the snow will rapidly pass away, surely none too soon for the poor birds. Saw part of the skin with a few feathers, of a small bird on thorn at edge of side road. A shrike had dined well and

*NOTE.—"The Model" to which Mr. Elliott refers so frequently in his Diary was an abandoned farm with swampy woods and an old neglected orchard which furnished the best possible ground for the botanist and ornithologist. With his gentle satire he christened it the "Model Farm."

some little songster suddenly ceased to sing. Saw flicker in maple at edge of orchard; also another on ant hill eating a medium-sized ant with brownish head and thorax, and black abdomen. Think of the storm last night and the hot sun today. When the ant hill is bare of snow the inmates sally out, the hungry flicker comes, and the great question is who is to live. How eagerly the ants were working to clear away debris! How pr ty the flicker's plumage in the light of the western sun!

April 7. Watched pileated woodpecker digging its nest in a high stub at 10 A.M. Noticed the bird at the same hole on March 17; nest was well dug out at that time. Now, last year, I saw a hole in the winter which was afterwards used by the pileated for an nest. Does this bird use the winter roosting place as a nest for the ensuing season, and are their nests occupied for more than one season? The yellow-shafted flicker does this.

April 8. Visited Gough's in the evening. Many signs of spring, the more notable being blossoms of *Erigenia bulbosa*, *Claytonia* and *Hepatica*. What delicate odors and most exquisite tints these early nurslings of April show! Near the spot where the Harbinger of Spring starred the gray knolls, a male chewink cheerfully sang; another answered him from a neighboring copse. Heard a W. R. shrike singing a feeble song on top of a high elm.

April 9. Captured a specimen of the butterfly *Grapta j-album*. Saw three individuals at different places and followed one a long distance but owing to its very rapid flight it escaped. How perfectly the under side of its wing assimilates with the grey of decayed leaves and wood. When the wings are closed it is very difficult to make it out among dead leaves, and no doubt by this means it often escapes the notice of sharper eyes than mine, viz:—those of the keen and hungry birds.

April 10. I walked one and half miles along the river from Model to Plover Mills. It was very pleasant, the bright sun was setting at the head of a long ravine, the moon overhead was slowly gathering light, and on the opposite side of the singing river, half way up a wooded slope, a bright fire was burning in a sugar

camp. What a restful rural sight! The birds were fairly bubbling over with melody, the sweet vesper sparrows, perhaps, carrying off the palm.

April 11. Heard a brown creeper gaily singing as he wound around a mossy ash. Saw two black squirrels chasing each other round the dead top of a tall maple. A flying squirrel came out of a hole and descended gracefully to a bass-wood stub nearby. On striking the stub the squirrel went down to a brush heap. On agitating this it crawled to the foot of a beech and going to the top, passed to the foot of its home tree and so back to the nest.

April 14. Today Dirca doffs the brown fur cap he wore throughout the winter and gaily shakes his golden forelocks in the sun. Saw four red-backed salamanders. Hylas are incessantly harping in the pool.

April 23. A ruffed grouse built its nest among beech leaves in a brush pile, a hen had a nest four feet from it. The first egg laid by the grouse was accidentally destroyed by a person going to the hen's nest. The grouse then laid in the hen's nest and they have laid five eggs apiece.

May 3. Saw ruffed grouse making its nest near the ridge.

May 6. Followed the "Peeper"—little tree toad, (*Chorophilus triseatius.*) Owing to some ventriloquial power the creature is hard to locate. I found this individual on the grass, on the edge of a pool with its throat much inflated, peeping vigorously, and occasionally uttering a gurgling trill of longer duration.

May 7. Exceedingly warm, quite like June, leaves bursting on every side. What a keen delight is afforded the one who takes a wood-walk today. Butterflies glancing and pirouetting over the blossoms, bees on the Claytonias and Violets, the juneberry hanging her graceful leaves on the forest's skirts, squirrels chattering and birds bubbling over with song. An irresistable march onward of nature's various forces.

June 5. Father saw dead *Procyon lotor* (racoon) in pasture. I saw live *Mephitis mephitica* in woods. At sight of me it retreated to burrow in a knoll and on my standing still it re-

turned near me and foraged assiduously among leaves and rubbish apparently for beetles. It frequently dug an inch or two after its prey. No smell was noticeable. The most surprising thing connected with this animal in the woods is the enormous size of its tail.

June 15. Visited the carp pond and on the trees around it large numbers of *Hyla versicolor* were trilling musically. I captured four, three of them greyish and one greenish. I watched them for an hour in the bottle and noticed that the greenish one, (the largest) was the only one that trilled, the others merely offering a soft chic, chic, chic. The greenish one was the only one attempting to copulate with the other ones. It was certainly a male and I presume the others were females. I am not aware that sexual distinction is connected with the color of this very variable species; but there is a clear difference in the notes of the sexes. This is interesting. I also noticed that after handling these viscid hylas and accidentally rubbing my eyes I felt a smarting that lasted for twenty minutes or so. I suppose no bird or mammal finds them at all palatable. I would like to offer one to *Procyon lotor*, who greedily devours the Ranas.

June 19. The afternoon turning out fine I had the choice of going to a picnic or to the Model. The winds whispered in the beeches, and I went to the latter alone save for the buzzing thoughts that hummed through my head. Splashing through the swamp there, I came half unaware on a magnificent group of *Cypripedium spectabile*, and I did not envy Wordsworth with his heart dancing with the daffodils. Seventeen blossoms had opened out, the peerless flowers all perfect as one could wish, purple and pink fading invisibly into immaculate white these boats floated in the ethereal air waiting for some dainty Ariel to set a filmy sail above them, and ready to waft them whither he wished. Or indeed it may be (so dull are mortal senses) that they were moccassins fashioned by the patient worker, Nature, for some fairy Indian maiden, for her wedding hour by the light of the full moon this very midsummer night. Be all this as it may, a portion of this beauty pierced deep through my eye and down to my heart. A swamp sparrow brooded on her eggs near by, and a veery filled the woods with his clingle clangle, a silver bell

with a golden tongue. Coming down to Plover Mills with four of the fairy boats what voyageur ever made a lighter portage? There, R. Y. had caught for me a Menobranchus and no stronger contrast could be found in nature than was presented between the burden of my right hand and of my left, in one a glorious flower, in the other a hideous amphibian.

The Menobranchus measured 11 3-4 inches; it was rather dark brown on the back with five lighter brown blotches and some large very dark brown spots all over the back and sides; abdomen yellowish brown with a few spots along the centre. The gill tufts (three pairs) had dark brown ends with blood red bases at the gill orifice; four toes on each foot; upper lip slightly overlapping the lower; many small teeth on palate, tongue large but short; head measured one and half inches in length; body from fold of throat to vent five and half inches; tail 4 inches. Is this *lateralis* or *maculata*? It seems to be the latter but it is *lateralis* that Dr. Brodie has. Dr. Garnier mentions another species which he describes as rare, namely *M. Huronense* which is said to be about one foot long, deep sooty brown on back, lighter beneath, throat white, upper jaw hooked over the lower. This seems to agree pretty well with mine. Concerning my specimen I should note that it was caught on a hook baited with earth worm; this was about 3.30 P.M.; the water was very dirty and the river high owing to recent rains.

June 28. At the head of Plover Pond I was looking at a red squirrel at foot of maple and black squirrel close to a nettle tree. The dog Dash made a run for the squirrels when I noticed a great blue heron rise from the shore; and closer, and of much more interest, a female merganser moving out into the water making a quacking sort of a sound. She then flew south half a mile and presently returned. While watching the squirrels I thought I noticed something like a large bird fly down from a dead tree close by the shore and the idea took hold that the bird may be breeding there. This is worth attending to. I resume the hooded merganser is the most likely species to be found here.

BIRD MIGRATION, 1905.

OBSERVATIONS MADE ON SABLE ISLAND, NOVA SCOTIA.

By JAMES BOUTEILLER.

Name of Species.	When First Seen.	Number Seen.
Ringneck Plover	April 23	One.
Common Arctic Tern	,, 27	A few.
Flicker	,, 27	One.
Junco	,, 30	Several.
White-throated Sparrow	May 3	One.
Red Phalarope	,, 4	One.
Greater Yellow-legs	,, 6	About a dozen.
Least Sandpiper	,, 8	One.
American Pipit	,, 12	One.
Roseate Tern	,, 13	In numbers.
Great Blue Heron	,, 18	One.
Henslow's Sparrow	,, 18	Several.
Spotted Sandpiper	,, 22	One.
Red Phalarope	,, 22	In large flocks.
Spotted Sandpiper	,, 25	In numbers.
White-crowned Sparrow	,, 25	In numbers.
Shore Lark	,, 25	One.
Pine Warbler	,, 28	One.
Wilson's Phalarope	June 7	One. First one ever seen here.
Pine Siskin	,, 16	One.
Yellow Warbler	,, 25	One.
Crossbill, American	,, 25	One.
Greater Yellow-legs	July 10	Two.
Wilson's Snipe	,, 13	Six.
Swallows	Aug. 9	Four.
Yellow Warbler	,, 9	One.
Greater and Lesser Yellow-legs	,, 10	In numbers.
Pectoral Sandpiper	,, 10	Several.
Turnstone Plover	,, 10	In numbers.
White-rumped Sandpiper	,, 11	Several.
Black-bellied Plover	,, 20	In numbers.
White-rumped Sandpiper	,, 20	In numbers.

Name of Species.	When First Seen.	Number Seen.
Swallows	,, 20	In numbers.
Golden Plover	,, 20	Several.
Bartramian Sandpiper	Sept. 8	One.
Buff-breasted Sandpiper	,, 12	One. First one I have ever noticed here.
Black and White Warbler	,, 12	One.
Cedar Waxwing	,, 12	One.
Pipits	,, 16	In numbers,
Flicker	,, 16	One.
Palm Warbler	,, 16	In numbers.
Pine Warbler		Several.
Chimney Swift		One.
White-throated Sparrow		Several.
Osprey		One,
Fox Sparrow		One
Kinglet		One.
Rusty Blackbird		In numbers.
Myrtle Warbler		In numbers.
Black-throated Green Warbler	Oct. 7	One.
Various Hawks and Sparrows	,, 7	In numbers.
Fox Sparrow	,, 7	In numbers.
Kinglet	,, 7	Several.
Black-throated Blue Warbler	,, 7	One.
Junco	,, 16	Several.
Fox Sparrow	,, 20	Several,
Hermit Thrush	,, 22	One or two.
Killdeer Plover	,, 22	One.
Long-tailed Squaw	,, 25	In numbers.
Black Creeper	,, 25	One.
White-winged Scoter	,, 25	In numbers.
Baldpate	,, 28	In numbers.
Woodpecker	,, 31	One.
Junco	Nov. 12	About a dozen.
Robin	,, 22	Several.

*See foot note.

*All came during N. W. blow which lasted for two or three days beginning 30th September.

Name of Species.	When First Seen.	Number Seen.
Snowy Owl	,, 25	About a dozen.
White-winged Scoter	Dec. 1	In numbers.
Shelldrake	,, 22	In numbers.
Bluebill	,, 22	In numbers.
Northern Shrike	,, 22	One. Has been here about a month.
Shore Lark	Jan. 6	Three.

MEETINGS OF THE ENTOMOLOGICAL BRANCH.

A good meeting of the Entomological Branch was held at Dr. Fletcher's apartments on the evening of March 23, at which 8 members were present. The chairman exhibited some rare butterflies taken in the Yukon Territory by Mr. Jos. Keele, and by Mr. W. J. Wilson, both of the Geological Survey. Among those taken by Mr. Keele, the most remarkable were *Erebia magdalena* and *Eurymus boothii*.

Mr. Harrington exhibited his collection of *Dytiscidae*, all of which had been recently examined by Mr. J. D. Sherman, Jr., of New York. This collection contains 50 species from Ottawa and will be of great value to local coleopterists in naming their specimens of this little-worked family. There were 7 species which could not be named.

Mr. Gibson showed a fine specimen of *Sthenopsis thule* taken by him on July 6 last. This is the first authentic record of this rare moth ever having been taken at any other place than Montreal, the type locality. Mr. Gibson also showed a leaf of an *Ixia* from the greenhouse at the Experimental Farm which was thickly matted with the dead bodies of a species of aphis, every specimen of which had been destroyed by a minute Chalcid parasite, and read a note on the behaviour of the parasite when stinging its victims.

Mr. Young exhibited a series of nine specimens of *Eucosma solandriana*, showing a remarkable range of variation. These

had all been taken by him about the lower branches of *Ostrya Virginica* in July and August last.

Mr. Baldwin exhibited a specimen of the West Indian moth *Melipotis fasciolaris* taken by him in Otawa last summer and read a note upon its capture.

Mr. Metcalfe showed 13 species of orthoptera, all taken at Ottawa.

Mr. Halkett showed some parasitized pupae of various kinds from his collection.

Mr. Wilson gave an account of the country he was exploring last summer in the Temagami district.

A copy of Dr. E. P. Felt's sumptuous memoir Insects Affecting Park and Woodland Trees, Volume 1, was laid on the table and was much admired by all present.—J. F.

Held at Mr. Gibson's, 20th April. Messrs. Halkett, Fletcher, Harrington, Keele, Metcalfe, Baldwin, Newman and Gibson present.

Mr. Halkett exhibited living specimens of the nymphs of some May-flies and Stone-flies which he had collected from the Rideau river. He said that he had found these in thousands, near St. Patrick's Bridge, swimming up the river against the current. He also showed one of the curious cases, with the larva inside it, of a caddis-worm.

Dr. Fletcher spoke of an interesting occurrence at Ottawa, in very destructive numbers, of a tineid caterpillar. This minute larva is at present working inside the tips of white cedars, killing many twigs and giving the trees a very unsightly and unhealthy appearance. Specimens of the work of this minute insect were examined. Dr. Fletcher also showed some living parasites, *Pteromalus puparum*, reared from the chrysalids of the Common White Cabbage Butterfly. Mr. Harrington mentioned that he had found the cases of *Coleophora laricella* in large numbers on wild trees of *Larix Americana* at several places in the Ottawa district. A living specimen of *Meloe niger*, one of the first insects to appear in the spring, was also shown by Dr. Fletcher.

This species is as a rule rather rare in collections but is always common at Ottawa.

Mr. Harrington exhibited a collection of 11 species of *Andrena* taken at Ottawa and Toronto, which had recently been critically examined and named by Mr. Viereck, of Philadelphia. He also showed a perfectly fresh specimen of *Scoleoptervx libatrix* which he had caught the day before. He was under the impression that the specimen must have recently emerged from the pupa. There was some discussion on the winter habits of the species, which branched off into the abundance of some Vanessians last autumn and this spring. There was reason to hope that *Vanessa j-album* might this year be again abundant and all members were urged to try and secure eggs of this species so that the full life-history might be worked out.

Mr. Metcalfe showed some living larvæ of *Leucania commoides*, and also one of a species of *Crococa*, as well as a small collection of micros taken in Toronto and mounted by himself.

Mr. Baldwin exhibited a fine specimen each of *Apantesis celia* and *virgunculа*, which had been taken by him during last season. Both of these moths are rare in this locality.

Mr. Newman spoke of the injuries by the larvæ of *Grapholitha interstinctana* to the clover seed crop in Ontario. He had found the larvæ very abundant in Victoria, Durham, Peterboro and Prince Edward counties.

Mr. Gibson showed some specimens of a *Coleophora* found this spring upon the heads of Yarrow and also some yellow larvæ of a moth hibernated in the Dry stems of *Oenothera*. Larvæ of *Penthina hebesana*, in the heads of mullein were also exhibited.—A. G.

CORRECTION.

On page 107 of the last issue of the OTTAWA NATURALIST *Pachystima Myrsinites* and *Pachystima macrophyllum* were by the printer marked "sp. nov." after the last proofs had left the editor's hands The former of these species was described by Rafinesque the latter by Miss Farr.

REVIEW.

MOSSES WITH A HAND-LENS AND MICROSCOPE. A NON-TECHNICAL HAND-BOOK OF THE MORE COMMON MOSSES OF THE NORTH-EASTERN UNITED STATES. By A J. Grout, Ph. D. Parts I, II and III, published by the author, 360 Lenox Road, Brooklyn, N.Y. $1.00 a part.

In his preface Dr. Grout says: "Mosses are indvidually so small and inconspicuous that the effect which they have as a mass in creating and enhancing the beauty of natural scenery is often overlooked," and as he later points out many would have collected and studied them had not the difficulties been so numerous and hard to overcome. It is to lessen the number of these difficulties that "Mosses with a Hand-lens and Microscope" has been published. A short review of "Mosses with a Hand-lens" was printed in THE NATURALIST a few months ago. Useful as that book is to young students it cannot compare in value with Dr. Grout's later and more exhaustive work. The same methods have been used but the hand-lens being replaced by the microscope it has been possible to refer to many microscopic distinctions that could not be detected at all, or only with great difficulty, by a hand-lens. Though purporting to be only a hand-book of the mosses of the northeastern United States, nearly all eastern Canadian species are included.

The first 46 pages of Part I are divided into (1) Introduction (2) Classification and Nomenclature. (3) The Collection and Preservation of Mosses. (4) How to mount Mosses. (5) Methods of Manipulation. (6) Life-History and structure of the moss plant. (7) Illustrated glossary of bryological terms. The description of species and the characterization of genera and orders is so exact that any one familiar with moss terminology should have little difficulty in determining the species he collects.

Heavy coated paper, new type and illustrations without number add to the value as well as the appearance of what must be considered the most important work that has yet been published on American mosses. No other book will be needed by any moss-student except the specialist.

JOHN MACOUN.

THE OTTAWA NATURALIST.

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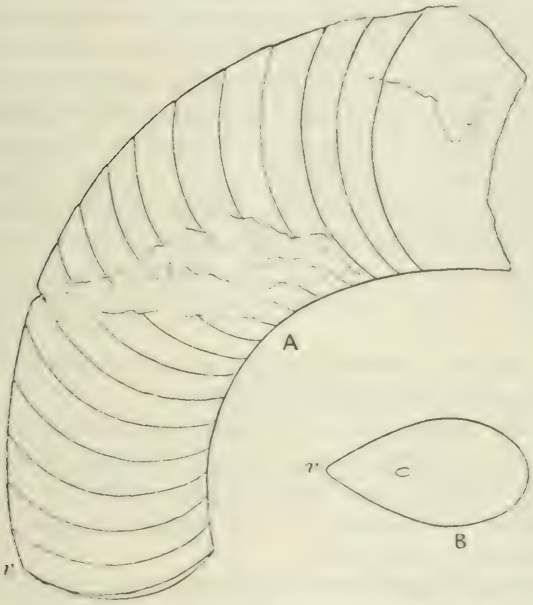
NOTES ON CYRTOCERAS CUNEATUM.*

By J. F. WHITEAVES.



Cyrtoceras cuneatum, A. Side view of the type and only known specimen of this species, in outline only. B. Smaller end of the same, also in outline. Both figures are of the natural size, and in both *v* is the venter.

This species was based upon a single specimen from the Silurian rocks at Stonewall, Manitoba, collected by Mr. D. B.

*Communicated by permission of the Director of the Geological Survey Department.

Dowling in 1902, and now in the Geological Survey of Canada. It was described by the writer in the fourth and last part of the third volume of "Palæozoic Fossils," recently published by the Survey, but it was not illustrated, as the type and only known specimen was unfortunately mislaid.

This missing and previously unfigured type has since been found, and it is now practicable to give two illustrations of this interesting specimen, and to slightly amend the original description of the species.

In regard to the two foregoing text figures of *C. cuneatum*, the explanations given below them may be supplemented by the following remarks. The specimen is a cast of the interior of part of the septate portion of the shell, with sixteen of the chambers preserved, and of a small piece apparently at the commencement of the body chamber. Figure A shows both the arcuate contour of the fossil, and the widely and shallowly concave lobe of each of the sutures, as viewed laterally. Figure B, on the other hand, shows the lateral compression, the ovate cuneate transverse section, as seen in an end view of the smaller end of the specimen, the narrow venter, and the apparently eccentric position of the siphuncle.

The original description of the species may be slightly and briefly amended, so as to read as follows:

"Shell widely arcuate, strongly but rather obliquely compressed, very narrow on the periphery or venter, much wider but narrowly rounded on the dorsum, the outline of the transverse section being ovate cuneate, and the lateral diameter to the dorso-ventral about as three to five.

"Septa averaging about six millimetres apart laterally, the sutural lines being shallowly concave on both sides and produced into a narrow pointed saddle on the venter." Test unknown. Shape and position of the siphuncle not very clearly defined in the only specimen collected, though at the smaller end thereof there are indications that it was eccentric and placed a little on the ventral side of the centre, as represented in figure B.

The shell is "evidently not a true *Cyrtoceras*, but a probably new generic type, which there is not yet sufficient material to define satisfactorily."

CONTRIBUTIONS TO CANADIAN BOTANY.*

By JAMES M. MACOUN, Assistant Naturalist, Geological Survey of Canada.

XVII.

Since the last of these papers was published a great many species have been added to the list of those known to occur in Canada; the distribution of others has been greatly extended and a large number of notes worthy of publication have accumulated in our herbarium. Much of this material will be utilized in publications which will be issued from this Department at an early date but it is hoped to print from time to time in THE OTTAWA NATURALIST records that might not find a place elsewhere. Some of these records have appeared in other publications, but as these notes are intended primarily for Canadian workers not all of whom have access to current botanical literature, and in nearly every case new information as to distribution has been added, it has seemed best to make the record as complete as possible by including some matter that has been published elsewhere.

DICKSONIA PILOSIUSCULA, Willd.

In sandy woods, Courtland, Norfolk Co., Ont., 1901. (*John Macoun.*) Rare in western Ontario.

ASPLENIUM RUTA-MURARIA, L.

On limestone rocks, north end of Manitoulin Island, Georgian Bay, Ont. Collected by Dr. Scot, of Southampton, in 1901. New to Canada.

ADIANTUM PEDATUM, L., var. ALEUTICUM, Ruprecht.

A. pedatum, Cat. Can. Pl., II: 263 in part.

Represented in our herbarium by four sheets of specimens, all collected on Mt. Albert in the Shickshocks, Gaspé, Que. Two of these sheets were collected by Prof. John Macoun in 1882, and two by Messrs. Collins and Fernald in 1905.

*Published by permission of the Director of the Geological Survey of Canada.

EQUISETUM LAEVIGATUM, Braun.

Roadsides at Windsor, Ont., 1902. No. 66,396, (*John Macoun.*) Not recorded from eastern Canada.

SPARGANIUM FLUCTUANS, (Morong) Robinson, Rhodora. VII : 60.
S. androcladum, var. *fluctuans*, Cat. Can. Pl., II : 70.

The only Canadian locality cited by Dr. Robinson is Lake Memphremagog, Que. Our specimens are from Campbellton, N.B., No. 28,052*, (*Chalmers*), Lake Mistassini, Que., No. 28,053, (*J. M. Macoun*) and Great Opeongo Lake, Algonquin Park, Ont., No. 22,562. (*John Macoun*). It was reported by J. M. Macoun from Severn River, Keewatin.

PANICUM PHILADELPHICUM, Bernh.

P. capillare, L., var. *flexile*, Gattinger.
P. flexile, (Gatt.) Scribner.

On sand, southern point of Pelee Point, Lake Erie, Ont., July 28 1892. Referred at the time to *P. capillare*; by marshes, Sarnia, Ont., Herb. No. 26,332, and on Birch Island, Lake Huron, No. 26,331. (*John Macoun.*) Pelee Point, Lake Erie, Sept. 7th, 1905, growing among *Juniperus Virginiana*. (*A. B. Klugh.*)

TRISETUM MELICOIDEUM, (Mx.) Vasey.

Graphephorum melicoides, Cat. Can, Plants II : 228 in part.

Woodstock, N.B., No. 22,687 ; Madeline River, Gaspé, Que., No. 29 481. (*John Macoun.*) Aroostook River, N.B. (*Williams*, *Collins* and *Fernald.*) Ste. Anne des Monts River, Gaspé, Que (*O. D. Allen.*)

TRISTEUM MELICOIDEUM, (Mx.) Vasey, var. COOLEYI, (Gr.) Scribn., Rhodora, VIII : 87.

Graphephorum melicoides, Cat. Can. Plants II : 228 in part.

Little Cascapedia River, Que. (*Collins*, *Fernald* and *Pease.*) River de Brig, Anticosti, Que., No. 29,479 ; Chelsea, Que., No. 61,297 ; Hastings Co., No. 29,482 ; Johnstone's Harbour, Lake Huron, Ont., No. 26,222. (*John Macoun.*) Galt, Ont. (*W. Herriot.*) Fishing Islands, Lake Huron, Ont. (*J. Bell.*)

*Specimens have been distributed from the herbarium of the Geological Survey under these numbers.

AVENA STRIATA, Michx. forma ALBICANS, Fernald, Rhodora, VII: 244.

A. striata, Cat. Can. Pl. II : 213 in part.

Distinguished from the species only by its pale, straw-colored glumes. Collected on Mount Albert, Gaspé, by John Macoun in 1882, No. 30,085. Described from specimens found at the same place and at Bic, Que , by Messrs. Fernald and Collins in 1904 and 1905.

BROMUS JAPONICUS, Thunb.

B. patulus, Mert. & Koch.

Collected at Toronto, Ont., by Mr. W. Scott and called *B. squarrosus* to which it is very similar. Mr. Scott's specimens differ from typical *B. Japonicus* in their short-rayed panicles. Introduced. New to Canada.

SCIRPUS VALIDUS, Vahl.

S. lacustris, Cat. Can Pl., II : 99 in part.

Sable Island, N.S., 22,633. (*Macoun.*) Campbellton, N.B., 32,359. (*R. Chalmers.*) Ottawa, Ont., 7,541; Chelsea, Que., 61,187 ; Niagara Falls, Ont., 34,583 ; Algonquin Park, Ont , 21,906 ; Lake Nipigon, Ont., 32,357. (*Macoun.*) Edmonton, Ont., 25,344. (*Jas. White.*) Grassy Narrows, Lake Winnipeg, 32,356. (*J. M. Macoun.*) Brandon, Man., 16,407 ; Sage Creek, Sask., 16,410 ; Cardston, Alta., 68,933 ; Cypress Hills, Alta., 16,409. (*Macoun.*) An abundant and widely distributed species not represented in our herbarium from west of Alberta.

SCIRPUS OCCIDENTALIS, (Watson) Chase, Rhodora, VI : 68

S. lacustris, Cat. Can. Pl. II : 99 in part.

S. lacustris, var. *occidentalis*, Wat.; Cat. Can. Pl. II : 100.

Brackley Point, P.E I , 32,309 ; Annapolis, N.S., 32,358; Grand Narrows, Cape Breton Island, N.S., 20,772 ; Sarnia, Ont., 34,582. (*Macoun.*) Toronto, Ont. (*W. Scott.*) Skull Creek, Crane Lake, Sask., 7,540 ; Prince Albert, Sask., 16,408 ; South Saskatchewan River, 32,361 ; Kananaskis, Rocky Mountains, 32,362. (*Macoun.*) Canoe River, head of Columbia River, Rocky Mts , 20,773. (*W. Spreadborough.*) Widely distributed in British Columbia but seldom collected.

S. occidentalis is distinguished from *S validus* by achenes ⅓ larger, by scales ¼—⅓ longer than the achene and nearly twice as long as the scales of *S. validus*, viscid-pubescent, overlapping ½ their length or more; by the cylindric more densely fruited spikelets in capitate clusters; and by the denser umbels and harder culms.

SCIRPUS HETEROCHÆTUS, Chase, Rhodora, VI: 70.

Distinguished from *S. validus* and *S. occidentalis* by the 3-cleft style, by the triquetrous achene, by the fragile bristles, fewer and shorter. An apparently rare species in the United States and not yet recorded from Canada. Mr. Ezra Brainerd found the three species growing in Lake Champlain where *S. occidentalis* begins to ripen seeds about six weeks later than *S. validus*; *S. heterochætus* flowers there at a date midway between the two.

RHYNCHOSPORA CAPILLACEA, Torr., var. LÆVISETA, Hill.

In bogs at Southampton, Ont,, Aug. 20th, 1901, No. 34,573. (*John Macoun.*) Wet sand along the shore of Lake Huron at Oliphant, Ont. (*A. B. Klugh.*)

CAREX KATAHDINENSIS, Fernald, Rhodora, II: 171.

Collected by Prof. Ezra Brainerd at the "Grand Discharge" of Lake St. John, Que., Aug., 1901.

JUNCUS BUFONIUS, L. var. HALOPHILUS, Buch. & Fernald, Rhodora, VI: 39

Mr. Fernald records this variety from Riviere du Loup, Que., New Carlisle, Que., Bonaventure River, Que., and from Tracadie Beach and beach near Summerside, Prince Edward Island. Our only herbarium specimens are from Grand Narrows, Cape Breton Island, N.S., 20,708, (*John Macoun*), and mouth of Dartmouth River, Gaspé Co., Que. (*Collins, Fernald* and *Pease.*)

ALLIUM RECURVATUM, Rydb.

Confounded with *A. cernuum* of the east Differs from *A cernuum* in the leaves, the more slender, ridged scape, the larger involucre and the more distinct midveins of the

perianth segments. In *A. cernuum* the leaves are almost flat and more or less keeled. In *A. recurvatum* there is no keel and the channel is rounded as well as the back. The leaves of *A. cernuum* are also much wider, the flowers are generally much paler in that species and the perianth segments have an indistinct midvein. *A. recurvatum* is common in the Rocky Mountains and British Columbia.

HABENARIA MACROPHYLLA, Goldie.

This species is much rarer than *H. orbiculata* with which in recent years it has been confounded. *H. orbiculata* ranges from the Atlantic to the Pacific and north to Alaska. *H. macrophylla* has not been found west of Wisconsin. Our specimens are from Newfoundland, 13,771, (*B. L. Robinson & H. Schrenk*), and Muskoka, Ont., 27,223. (*W. Spreadborough.*) Many specimens of both species have been examined by Mr. Oakes Ames; the spur of *H. orbiculata* was found to be from 16 to 27 mm. long, while that of *H. macrophylla* ranged from 32 to 43 mm. in length. The flowers of the latter species are also much larger.

SALIX CHLOROLEPIS, Fernald, Rhodora, VII: 186.

Meadows at the headwaters of Ruisseau au Diable, Mt Albert, Gaspé, Que. (*Collins* and *Fernald.*)

SALIX MACROSTACHYA, Nutt.

Along the Kettle River at Cascade, B.C. In flower, June 26th, 1902, No. 68,128. (*J. M. Macoun*). New to Canada.

SALIX SERISSIMA, (Bailey) Fernald, Rhodora, VI: 6.

S. lucida, Cat. Can. Pl. II: 450 in part.

Mr. Fernald gives no other Canadian localities for this species than "north shore of Lake Superior." Our herbarium specimens are from the mouth of Albany River, James Bay, Hudson Bay, No. 62,628. (*W. Spreadborough*); Salt Lake, Anticosti, Que., No. 24,584. (*John Macoun*); Galt, Ont., No. 63,120. (*W. Herriot*); Nipigon, Lake Superior, Ont., No. 24,583. (*John Macoun*); Severn River, Keewatin, No. 2,028, Beren's River, Man., No. 24,618, and Muskeg Island, Lake

Winnipeg, Man., No. 24,619. (*Jas. M. Macoun*); Grattan Creek west of Battle River, Alta.; Edmonton, Alta., No. 24,621, and Bow River at Morley, Alta., No. 24.620. (*John Macoun*).

SALIX LUCIDA, Mahl., var. INTONSA, Fernald, Rhodora, VI : 11.

Recorded by Mr. Fernald from St. John River and tributaries, Maine, Quebec, and New Brunswick. Our specimens are from Montmorency Falls, Que., Nos. 68,782 and 68,783. (*John Macoun.*)

SALIX LUCIDA, Muhl., var. ANGUSTIFOLIA, Anderson.

Grand Lake, N.B., No 24,586. (*John Brittain*); bank of Exploit River, Newfoundland, No. 13,674. (*Robinson & Schenk.*)

HUMULUS JAPONICUS, Sieb. & Zucc.

In waste places at Wakefield, Que., 1903. (*John Macoun.*) Naturalized.

COMANDRA RICHARDSIANA, Fernald, Rhodora, VII : 32.

C. umbellata, Nutt., in part.

So far as shown by our specimens *C. umbellata* does not occur in Canada, everything so called being the recently described *C. Richardsiana*.

POLYGONUM NUTTALLII, Small.

P. intermedium, Macoun, Cat. Can. Plants, II : 352.

Grassy banks, Middle Creek, Chilliwack River. B.C., No. 54,740. (*J. M. Macoun.*) Not recorded from mainland of B.C.

POLYGONUM PUNCTATUM, Ell., var. LEPTOSTACHYON, (Meisn.) Small.

Low ground near Sumas Lake, B.C. No. 54,752. (*J. M. Macoun*) New to Canada. Abundant, but perhaps introduced.

POLYGONUM BISTORTOIDES, Pursh.

A common species at an altitude of between 5,000 and 6,000 feet on mountains in the Chilliwack and Skagit valleys, B.C., near the International Boundary. (*J. M. Macoun.*)

CHENOPODIUM BOSCIANUM, Moq.

Sandy thickets, Pelee Point, Lake Erie. No. 54,724. (*John Macoun.*) New to Canada.

AQUILEGIA COLUMBIANA, Rydb., Bull. Torr. Bot. Club, XXIX: 145

This species is somewhat intermediate between *A. formosa* and *A. truncata* and has been mistaken for both. It has the habit, spur and sepals of the former and the short truncate lamina of the latter. From Banff to Alaska.

DELPHINIUM BROWNII, Rydb., Bull Torr Bot. Club, XXIX: 148.

This is most nearly related to *D. glaucum* but differs in the puberulent leaves with narrow segments, the lax raceme with more erect pedicels and the darker flowers. Described from specimens collected at Banff in 1893 by Addison Brown. A common plant in that region.

RANUNCULUS ALLENI, Robinson, Rhodora, VII: 220.

R. affinis var. *leiocarpus*, Cat. Can. Pl. I: 18.

First collected by Mr. J. A. Allen on Mt. Albert, Gaspé, Que., in 1881, the next year by John Macoun at the same place, No. 1,015, and in 1883 on Table Top Mountain not far from Mt Albert by James Porter, No. 68,678. Other localities cited by Dr. Robinson are: Okkak, Labrador, and Rama, Labrador.

RANUNCULUS GLABERRIMUS, Hook.

Penticton, Lake Okanagan, B.C., April 12th, 1903. No. 59,519. (*W. Spreadborough.*) Not recorded from that region.

RANUNCULUS YUKONENSIS, Britt.

Near Peace River Landing, Atha., No. 59,521, June 8th, 1903. (*J. M. Macoun.*) Recorded before only from the Yukon district.

CAULOPHYLLUM THALICTROIDES, Mx.

In woods along the Assiniboine River near Portage La Prairie, Man. In flower, May 31st, 1906. (*W. Herriot.*) Western limit in Canada

LEPIDIUM DRABA, L.

Waste places at Trail, Columbia River, B.C. No. 67,986. (*J. M. Macoun.*) Not recorded from B.C.

LEPIDIUM SPINOSUM, L.

Near the "ball grounds," Toronto, Ont., 1904. (*W. Scott*) New to Canada. A native of the Orient and of Greece.

SISYMBRIUM OFFICINALE, Scop.

Rare in Canada, our specimens being from Niagara, Ont., No. 33,859. (*John Macoun*); Wingham, Ont., No. 2,110 (*J. A. Morton*), and Esquimault, Vancouver Island, B C., No. 2,109. (*John Macoun*). The inflorescence and pods, even at full maturity, subtomentulose.

SISYMBRIUM OFFICINALE, Scop. var. LEIOCARPUM, DC.

This variety as pointed out by Dr. Robinson (Rhodora, vol. VII : 102) is the common form in North America being represented in our herbarium by specimens from Baddeck, Cape Breton Island, N.S., No. 18,039, (*John Macoun*); Ottawa, Ont., No 2,113, (*John Macoun*); Wakefield, Que., No. 59,813, (*John Macoun*); Belleville, Ont , No. 2,114, (*John Macoun*); Nelson, Kootenay Lake, B C., No 2,111, (*John Macoun*); Sicamous, B.C,, No. 2,112, (*John Macoun*); Nanaimo, Vancouver Island, B.C., No. 2,115, (*John Macoun*); Chilliwack River, B.C., No. 33,860. (*J. M. Macoun*). The inflorescence nearly smooth; the pods entirely glabrous or with a few scattered hairs.

RADICULA CLAVATA, (Rydb.) Bull Torr. Bot. Club, XXIX: 235. *Nasturtium palustre*, DC. var., Macoun, Cat. Can. Plants, II: 300 in part.

Port Heney and Agassiz, B.C., 1889. (*John Macoun.*)

DENTARIA TENELLA, Push.

Harrison, B.C., 1902 No. 63,504. (*W. Spreadborough.*) Eastern limit in Canada.

DRABA MCCALLÆ, Bull. Torr. Bot. Club, XXIX: 241.

Moose Mountain, Elbow River, Alta., No. 18,139, 1897; Summit of Pipestone Pass, Rocky Mt Park, No. 64,442, 1904. (*John Macoun*.) Described from specimens collected by Mr. W. C. McCalla at Banff in 1899. This species belongs to the *D. incana* group but differs from that species in the elongated peduncle, long pedicels, short pubescent pod and large petals.

ARABIS COLLINSII, Fernald, Rhodora, VII: 32.

"Quickly distinguished from *A. Holboellii* by the loose hispidulous pubescence of the stem and pedicels, the smaller flowers and the very slender acutish pods." Collected on dry limestone conglomerate ledges, headland in the harbour of Bic, Rimouski Co., Que., July 18, 1904. (*J. F. Collins & M. L. Fernald.*)

DROSERA ROTUNDIFOLIA, L. var. COMOSA, Fernald, Rhodora, VII: 9.

A dwarf variety of the common sundew with crimson or roseate instead of white flowers; the petals are sometimes foliaceous and the carpels are developed in maturity into green, glandular broadly obovate or oblate petioled leaves. Collected in abundance near the mouth of Grand River, Gaspé Co., Quebec., in 1904 by Messrs. J. F. Collins, M. L. Fernald and A. A. Pease. An examination of a large series of specimens of *D. rotundifolia* in our herbarium shows nothing approaching this variety.

SAXIFRAGA HIERACIFOLIA, Waldt and Kit.

Pond's Inlet, Lat. 72° 45', Cockburn Island. Aug 20th, 1904. (*Dr L. E. Borden.*)

THE SPRING MIGRATION OF BIRDS AT OTTAWA OF THE YEAR 1906, COMPARED WITH THAT OF OTHER SEASONS

By C. W. G. EIFRIG.

The winter of 1905-06 was in several respects a remarkable one. There was less snow and fewer days of severe cold weather than for many preceding winters. It was more open and mild, than for many past seasons. All this was somewhat changed at a time when one expects to see the end of winter come in earnest, in March. There was more snow and cold then, than apparently had been in the previous winter months combined, or as someone told the writer : Winter only commenced in March. That such unusual weather conditions would naturally tend to modify biological conditions in the plant and animal kingdoms, was to be expected. All nature-lovers, the botanists, entomologists, etc , therefore eagerly looked forward into the now sadly retarded spring, to see how this would be made manifest in their several lines of observation. In no class of biota, however, would the effect of such unusual climatic conditions be more noticeable than in the birds, as that fascinating, mysterious natural phenomenon of their migration is in many species greatly dependent on the weather. The ornithologist therefore was especially on the alert this spring to see how the coming of his feathered friends had been affected by the queer ending of the winter and beginning of the vernal season.

One somewhat unexplainable fact was noted by them already in winter. One would think, that in such a mild winter as the last was for its greater part, there would be more of our usual permanent residents amongst birds, or of the erratic Canadian winter birds seen, or at least as many, as in the more severe winters. But the reverse was true While in the severe winter of 1903-4 pine grosbeaks were plentiful here all winter, and 1904-5 Canada jays and sharpshinned hawks, together with, as the appended list shows, occasional downy woodpeckers, pine siskins, redpolls, brown-breasted nuthatches, and the everpresent jolly little chikadee, these and similiar birds were last winter conspicuous by their absence in the silent wintry woods.

Quite a number of the birds included in this list are irrelevant to the scope of this article, but are included for completeness' sake, to show about when they may be looked for and what birds come this way at all. Such birds that do not show anything in this connection are e. g. the redpoll, pine siskin, brown-breasted nuthatch, crow, blue jay, etc., because they may be considered permanent residents, or because they do not follow any apparent rules in their coming and going, their presence or absence. Other such erratic birds are the pine grosbeak, Canada jay, evening grosbeak, arctic-three-toed woodpecker, etc., which are here omitted. Others, such as the ducks, rails, herons, hawks are not quoted to prove much in this connection, because they are not easily observed or are rare, so that they may be for days or even weeks in their chosen haunts, before the ornithologist, who can not always go to such difficult places, may see them.

The effect that we would expect the severe outgoing of the winter and incoming of the spring to have upon the migration of birds, is that the birds would be retarded to a greater or less extent. And this is what the following list shows. The first commonly observed migrant in our parts is the prairie horned lark. That comes at the end of February. Now, because last winter up to that time was unusually mild, the coming of this little bird was earlier than usual, Feb 20, or at least no later. Then came the snowy and cold March, the effect of which can be seen by the lateness of arrival of such birds as the purple finch, robin, bronzed grackle, song sparrows, red-winged black bird, bluebird, and junco, which here are the first of the real and regular migrants. These were this year kept back for a time of from several days to two weeks. Then came warm, May-like weather in April, which made the date of arrival of the species falling into this month again normal, or may have even accelerated it with some, whereas the somewhat raw weather of the first half of May again had the contrary effect. It may be said, that a single, dejected-looking robin was this year seen as early as March 9th in a garden along the Rideau, and again on the 17th, but the real robin migration did not begin before the date given.

I must also state that much material in the line of dates has been furnished to me by other members of the Ornithological sec

tion, by the Messrs. G. and E. White, Kingston and Gallup, and by Mrs. R. D Brown and Miss Lees of Ottawa East.

	1906.	1905.	1904.
Sharp-shinned Hawk	.....	Feb. 18	Jan. 3
Crow	Jan. 28	Feb. 18	Mar. 3
Prairie Horned Lark	Feb. 20	Feb. 28	Mar. 7
Brown-breasted Nuthatch	Mar. 10	Mar, 1	Jan. 14
Great Gray Owl	Feb. 1	.....	.....
Cedar Bird	Mar. 17	Mar. 28	May 26
Purple Finch	Mar. 29	Mar. 1	May 4
Golden-eye *(Clangula Am.)*	Mar. 29	Apr. 17	Jan. 4
Robin	Mar. 31	Mar. 19	Mar. 24
Bronzed Grackle	April 2	Mar. 27	Mar. 28
Song Sparrow	April 2	Mar. 18	Mar. 24
Red-winged Blackbird	April 2	Mar. 24	Mar. 25
Bluebird	April 3	Mar. 24	Mar. 24
American Herring Gull	April 3	April 10	Mar. 24
Red-shouldered Hawk	April 1	April 24	April 25
Canada Goose	April 4	April 4	.....
White-breasted Nuthatch	April 4	Feb. 28	Jan. 30
Meadowlark	April 5	April 3	April 5
Blue Heron *(vulgo* Crane)	April 5	April 27	April 18
Junco	April 6	Mar. 23	Mar. 26
Hooded Merganser	April 7	April 17	April 14
Sparrow Hawk	April 7	April 18	April 21
Cowbird	April 8	Mar. 29	Mar 30
Downy Woodpecker	April 8	April 11	Jan. 14
Tree Swallow	April 8	April 3	April 8
Black Duck	April 7	April 13	.....
Wood Duck	April 7	.....	.....
Phoebe	April 9	April 8	Mar 28
Tree Sparrow	April 9	Mar. 24	April 15
Red-tailed Hawk	April 9	April 25	April 15
Marsh Hawk	April 12	April 1	April 17
Golden-crowned Kinglet	April 14	April 8	April 14
Hermit Thrush	April 14	April 10	April 14
Brown Creeper	April 15	Mar. 30	Mar. 12
Vesper Sparrow	April 15	April 12	April 15
Savanna Sparrow	April 15	April 11	April 18
Yellow-bellied Sapsucker	April 15	April 10	April 9
Chipping Sparrow	April 15	April 12	April 23
Flicker *(Colaptes auratus)*	April 16	April 10	April 18
Migrant Shrike	April 16	Mar. 30	April 6
Killdeer	April 16	Mar. 28	April 8
Kingfisher	April 16	April 8	May 5

	1906.	1905.	1904.
Bittern	April 16	May 24	May 3
Blue Jay	April 16	Feb. 18	Mar. 17
Goldfinch	April 17	Mar. 13	May 26
White-throated Sparrow	April 15	April 23	May 7
Osprey, Fish Hawk	April 18	April 17	.....
Winter Wren	April 18	April 27	.....
Swamp Sparrow	April 18	May 8	April 26
Wilson's Snipe	April 20	May 4	April 14
Pied-billed Grebe	April 20	.....	April 29
Barn Swallow	April 21	April 25	April 26
Hairy Woodpecker	April 21	May 5	May 17
Loon	April 21	.....	.....
Purple Martin	April 22	April 23	April 16
Chimney Swift	April 30	May 2	May 7
Ruby-crowned Kinglet	May 1	April 27	.....
Brown Thrasher	May 1	May 6	
Whippoorwill	May 1	May 13	May 5
House Wren	May 2	April 28	May 5
Spotted Sandpiper	May 2	May 4	May 5
Myrtle Warbler	May 2	May 1	May 4
Black-and-white Warbler	May 4	April 28	May 4
Fox Sparrow	May 4	Arpil 27	.....
Yellow Warbler	May 4	May 1	May 7
Bobolink	May 5	May 2	May 7
Connecticut Warbler	May 5	.....	
Cooper's Hawk	May 6	.....	Feb. 16
Warbling Vireo	May 6	May 10	May 12
Veery	May 6	May 6	May 7
Black-throated Green Warbler	May 7	May 1	May 10
Parula Warbler	May 7	May 10	May 7
Nashville Warbler	May 7	May 7	May 10
Pine Warbler	May 7	May 6	.....
Black-throated Blue Warbler	May 7	May 10	May 16
Kingbird	May 7	May 5	May 7
Rusty Grackle	May 7	April 10	April 18
Sora	May 8	.....	May 26
Blackburnian Warbler	May 10	May 1	May 7
Cliff Swallow	May 9	May 17	.....
Waterthrush	May 11	May 8	May 26
Great Crested Flycatcher	May 11	May 12	May 7
Yellow-throated Vireo	May 11	.....	.....
Least Flycatcher, Chebec	May 11	May 5	May 6
Woodcock	May 11	.....	May 26
Maryland Yellowthroat	May 11	May 4	May 10

	1906.	1905.	1904.
Cape May Warbler	May 12	May 22	.....
Rose-breasted Grosbeak	May 13	May 11	.....
Olive-backed Thrush	May 13	May 16	.....
Chestnut-sided Warbler	May 13	May 7	May 10
Ovenbird	May 13	May 6	May 10
Baltimore Oriole	May 13	May 6	May 8
Bank Swallow	May 13	May 18	.....
Yellow Palm Warbler	May 14	May 1	.....
Grey-cheeked Thrush	.....	May 14	.....
Red-eyed Vireo	May 15	May 6	May 12
Blue-headed Vireo	May 15	May 7	May 7
Catbird	May 15	May 6	May 12
Redstart	May 15	May 5	May 5
Hummingbird	May 15	May 11	.....
Bay-breasted Warbler	May 16	May 19	May 23
Magnolia Warbler	May 16	May 10	May 10
White-crowned Sparrow	May 16	May 6	May 10
Nighthawk	May 16	May 14	May 11
Tennessee Warbler	May 17	May 24	May 23
Scarlet Tanager	May 17	May 14	May 21
Wood Pewee	May 17	May 4	May 17
Solitary Sandpiper	May 18	.....	May 12
Mourning Warbler	May 19	May 12	May 23
Canadian Warbler	May 19	May 12	May 26
Yellow-bellied Flycatcher	May 19	May 23	.....
Alder Flycatcher	May 19	May 24	....
Least Sandpiper	May 21	.....	.....
Blackpoll Warbler	May 21	May 17	May 23
Wilson's Warbler	May 21	May 19	May 26
Red-headed Woodpecker	May 26	.....	April 26
Olive-sided Flycatcher	May 28	May 24	May 26
Broad-winged Hawk	May 28	April 25	.....
Philadelphia Vireo	May 30	May 17	.....
Indigo Bird	.....	May 24	May 26

NATURE STUDY No XXXVII.

The Cecropia Emperor Moth (*Samia cecropia*, Linn.)

By Arthur Gibson, Assistant Entomologist, Experimental Farm, Ottawa.

Cecropia Emperor Moth and Cocoon, reduced in size

Among our native insects, probably none attract greater attention from those who have made no study whatever of entomology than the large Emperor Moths, the caterpillars of all of which are true silk-worms. These moths are the largest we have in North America, and, being of such a size and also of striking beauty, they always command admiration. Unlike many other moths, their mouth parts are aborted and consequently they are unable to eat. In their caterpillar state, however, they are very voracious eaters and during that period of their existence will consume many times their weight of food. When full grown these

large, heavy caterpillars are found hanging on the underside of leaves and twigs, but on account of their green colour they are rather difficult to detect.

The Cecropia Emperor Moth, the subject of this article, is the largest and one of the most beautiful insects found in North America. When the wings have been spread this magnificent moth measures from five to seven inches across. The figure* given herewith, which has been reduced in size, shows the moth which is doubtless known to many of our readers. The four wings are of a rich brown and all are crossed with conspicuous bands. The band on each front wing is dull red, more or less edged within with white, while that on each hind wing is a brighter red, almost crimson in some specimens, edged distinctly inside with white. In the figure, which is from a photograph, only the white portions, of course, of these transverse bands show. The front wings are dusted with gray towards and along the upper margin, and through that portion of each wing beyond the transverse band. Near the centre of the wing, and also towards the base, reddish patches are present in most specimens. All the wings have, near the middle, a large nearly kidney-shaped mark which is white shaded more or less with red, and margined with black. The eye-like spot towards the tip of each front wing is black with a bluish white crescent, and the curved band near the base is white and black. The outer edges of all the wings are paler, and there is present on each front wing a wavy black line which on each hind wing is replaced by a double band of the same colour. The upper side of the body is dull red, as are also the legs. Just behind the head there is a wide white band. The abdomen in most specimens is reddish-brown, the cross bands of white being very conspicuous. Both sexes are similar in appearance, the female only differing from the male in the larger abdomen and much smaller antennæ, or feelers

It is often difficult to understand an author's reason for selecting the name by which a species is to be known, and much discussion among naturalists has taken place regarding Linnæus's application of the name of the ancient city of Athens, to this moth. The late Dr. Asa Fitch in his third report on the Noxious and

*From Fourth Annual Report of the Entomologist of the State Experiment Station of the University of Minnesota, kindly loaned by Prof F. L. Washburn.

other Insects of the State of New York, gives the following explanation :—"The idea which was present in the mind of Linnæus, when he named this splendid moth, we think is sufficiently evident. The Athenians were the most polished and refined people of antiquity. The moths are the most delicate and elegant of insects ; they are the Athenians of their race. Cecrops was the founder, the head of the Athenian people. When names of men were bestowed upon cities, ships, or other objects regarded as being of a feminine gender, classical usage changed these names to the feminine form. The moths (Phalæna) being feminine, and the name of Cecrops being more euphonious in this form, probably induced Linnæus to change it in the manner he did. The name thus implies this to be the leader, the head of the most elegant tribe of insects, or in other words, the first of all the insect kind. What name more appropriate can be invented for this most sumptuous moth?"

The cocoon of this insect, shown beneath the moth in the above figure, is the largest and best known of the cocoons found in this country. It is about three inches in length, an inch or more in width at its widest part, and tapers to both ends. Some specimens, of course, are larger than this ; we have examples that measure four inches long and two inches wide at the centre. In colour the cocoon is a rusty gray, or brownish. If one is cut into with a sharp knife, or a pair of scissors, an inner, oval cocoon will be found. Within this is a large, black pupa, to one end of which is attached the head of the caterpillar and the cast skin of its body. This inner cocoon will be noticed to be much more closely woven It is interesting to watch the caterpillar making its cocoon. From the time it begins to spin it never ceases until its work is completed, and the whole cocoon is spun in one continuous thread. In the case of the American Silkworm, *Telea polyphemus*, L., it has been stated by Trouvelot that this caterpillar in making its cocoon, will have moved its head to and fro, in order to distribute the silk, 254,000 times, the length of time taken to complete this operation being from three to five days.

During the past season the caterpillars of the Cecropia Emperor Moth have been more than usually abundant in eastern Canada. It is altogether likely, therefore, that many cocoons will be found on apple, maple, plum, and other trees during the coming winter. The moths emerge in the latter end of May and early in June, and if any of our members would like to experience the pleasure of watching one of these large Emperor Moths escaping from its cocoon, it is only necessary to collect one or two of the cocoons, and keep them in an

out-building throughout the winter, bringing them into the house next May. The cocoons, of course, should be put into a box with rough sides, so that when the moths emerge they can hold on while their wings are expanding. It will be noticed that one end of the cocoon is spun very loosely, and it is from this end that the moth emerges. The head first appears, then the front pair of legs, and soon the other pairs of legs, the heavy body, and the undeveloped wings. As soon as it has attached itself to a nearby object, these latter soon expand and in less than an hour the two pairs of wings attain their full size.

The caterpillars of the Cecropia Emperor Moth hatch from whitish eggs laid in June. They moult, or cast their skins, four times before reaching full growth. At first they are black, changing in the next stage to a deep orange, and in the third stage to yellowish green. In the next and also in the last stage the colour is more of a bluish green. In all the stages the body bears tubercles the colours of which are different after each moult. When full grown the Cecropia caterpillar is from three to four inches long, and is about as thick as a man's thumb. On segments 2 and 3, the tubercles are large and of a bright coral red colour; the other tubercles on the back are smaller and yellow, excepting those on the first and last segments which are blue, as are also the smaller tubercles along the sides. These caterpillars although so beautiful and striking in appearance, from their great size and conspicuously coloured tubercles, are considered very disgusting creatures by many, and this of course is but natural. It would not be human nature if everyone had the same likes and dislikes—it takes all kinds of people to make a world.

The caterpillar of this moth is a very general feeder and over fifty different plants have been recorded upon which it has been found feeding. In Canada the favourite food plants are apple, maple, birch, cherry, plum and willow. Although this caterpillar has a very voracious appetite, it is seldom that it really does very much harm, as it is unusual to find more than two or three larvæ on the same tree, and when their presence is noticed they can easily be removed by hand.

This grand insect occurs in Canada in Ontario, Quebec and the Maritime Provinces, and specimens may every year be collected or seen flying around electric lights. In certain seasons, however, their numbers are greatly reduced by natural parasites, the most important of which are the Long-tailed Ophion, *Ophion macrurum*, L., which forms a single close cocoon inside that of its host, and *Cryptus extrematis*, Cresson, of which several occur inside a single caterpillar, and when this latter has spun its winter resting place they emerge and entirely fill the space with their own cocoons.

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ANIMAL COLORATION.

By Professor EDWARD E. PRINCE, Dominion Commissioner of Fisheries, Ottawa.

Many years ago I delivered the opening lecture in a course of scientific addresses in the University of Toronto. I chose as my subject the colors of animals, and the same theme has been dealt with by me on several subsequent occasions. Apart, however, from a short article, entitled "Spots and Stripes," in the London "*National Observer*," and a brief notice in THE OTTAWA NATURALIST in 1893, I have not published my views on this subject.

It is a subject of general interest; and many authorities, Poulton, Beddard, Eimer, Garstang, and others, have treated it more or less fully; but as Professor McIntosh, in the "Annals of Natural History" last year, pointed out, very many of the theories offered are wholly inapplicable to some of the most familiar and striking cases of animal coloration.

My own conclusion is that pelagic animals, the small colorless creatures abounding at the sea's surface, are primitive. All animal life was originally colorless and possibly transparent, like glass. The first colors appearing in animals were due to vegetable food, or to parasites, especially "plant commensals"; but by-products, resulting from digestive and other processes, also produced animal colors. Colors of a brilliant prismatic character appeared, no doubt, in jelly-fishes and other transparent animals in the seas of the early world. These rainbow tints may be due to "thin plates" as discovered by Sir Isaac Newton in the soap-bubble, and seen also in the wings of the house fly, elytra of beetles, scales on butterflies' wings, &c., or may be produced by minutely grooved or striated surfaces, producing lustrous tints as in

mother-of-pearl, feathers of tropical birds, insects and shells. Sir David Brewster found that the wax impression of a pearl showed rainbow colors like the original pearl. These "interference" colors, due to striations on the surface, or to prism-like transparent parts of animals, illustrate some of the most gorgeous effects observable in living things. The silvery color of many animals is not due to pigment or color, but to glistening smooth surfaces, and thus must be classed merely as "specular reflection."

Ancestral Coloration.—The ocean is, as August Weissmann declared, the original birthplace of all animal life. The simple protozoan animals, and larval stages of higher forms, abounding in the sea, are in most instances, of a colorless transparency, at any rate in the earliest period of their lives. Even in such highly organised creatures as the fishes, the minute embryos, at a very early stage of development, are colorless and translucent. Further, the body is not only colorless, but it is wormlike, segmented, or metameric. Annelids, insects, crustaceans, mollusks, ascidians, fishes, reptiles, nay even birds and the highest animals, may exhibit a colorless metameric body.

When color spots first appear in these, they are grouped serially, thus forming transverse patches or stripes from the head to the tail. This metameric coloring is very prevalent in the young of all classes of animals.

If the segmented body be ancestral, then there is strong presumption that repeated stripes and spots are ancestral also. They persist even though their use and meaning may have gone. Like the two buttons on a dress coat which served to hold up the sword-belt when our forefathers were accustomed to carry swords; but are now of no use, though, thanks to the tailor, they still persist, so we find transverse stripes, still appear as the first coloration in a vast number of animals.

A larval cod, a week or ten days after hatching out from the egg, exhibits a series of black stripes, and the young salmon and trout show cross bars, or "parr marks," which may be readily derived from the striped condition just referred to. Now, in some young flat-fishes the bars along the sides of the body divide into spots or large patches, four rows of them, and still preserving the metameric or serial succession from the head to the tail. Thus

from successive cross-stripes, the spots arise, and these surface arrangements of color appear to continue long after the internal organs, the muscles, &c., have wholly altered their original anatomical arrangement. Further, the successive series of spots may unite later as longitudinal stripes, and such stripes we find in the post-larval ling (*Molva*). We thus have a key to the arrangement of color in a vast number of animals. Wild pigs, though uniformly tinted when adult, exhibit when young a spotted skin, says Mr. Alfred Tylor, and later become striped. The dark tapir shows white spots, like the Virginian deer, when young. The Canadian lynx is striped with dark reddish lines along its deep brown body, as described in 1883 by Mr. Montague Chamberlain, who hence deduced that it must be related to the Ocelot group of the Felidae. Chickens, ducks, and other birds are similarly striped, quite unlike their parents. No doubt the repeated spots, bars and patterns, seen in caterpillars and many larval insects, are really ancestral. Weissmann held that these stripes have come down from a geological time when jointed reeds, and ribbed grasses preponderated; but this is apparently not a primitive cause; but like the zebra's and tiger's stripes they were ancestrally-metameric and utility explains their persistence, and modification. The striped tiger is practically invisible in his haunts among the yellow sword-grasses of the jungle, while a troop of zebras on the African plain, moving as they do in the moonlight, are practically invisible, owing to their remarkable arrangement of colors. Many young birds, like the gannet, may be of a dull brown color until their third year, possibly a case of blurred spots or stripes, which disappear and give place in the species named to a creamy white plumage. The dark bars of the yellow perch (*Perca*) and of tropical fishes like the Chaetodons, aid in obscuring these creatures amongst aquatic weed-blades. On the other hand, spots of color may be so modified as to resemble staring eyes, and may serve as Poulton suggested, to direct the attention of enemies to non-vital parts. The effect may, however, be the opposite and the eye-like spots may so suddenly strike the attention of enemies and startle them as to frighten them away.* The peacock butterfly (*Vanessa Io*),

* The eyelike spots on some larvæ of Lepidoptera may have this effect, e.g. the larva of the Elephant Hawk Moth (*Chærocampa elpenor.*)

the Emperor moth, nay even the *Polypectron*, the gorgeous Malacca pheasant, the ocellated turkey with a row of eye-like spots at the end of the tail, may thus find explanation. Many of the small shore fishes, like the Gobies, and the Skulpin (*Callionymus*), exhibit in the dorsal fin one or more shining eye-like spots, often explained as due to sex-selection, as the males usually bear these ornaments ; but they may be of a warning character.

Trophic Coloration.—Food is frequently potent in color production. Translucent young fishes may have a bright pink color over the abdominal area, due to Copepods, &c., undergoing digestion, while Salpae often owe their yellow color to diatoms swallowed as food. N. Chautard found that green chlorophyll remained unchanged in color when taken in by animals. Examples are green oysters among Mollusks. and the green Cantharides among insects. Medical men are familiar with the effect of digesting colored materials. Young children may be brilliantly tinted over the head, face, arms and skin after accidentally swallowing aniline dyes, and bird-fanciers, who give young canaries Cayenne pepper in their food, can deepen the yellow plumage, as the fatty Triolin of the pepper (not the Capsicin as often stated) passes to the feathers. Sauermann's experiments with white hens showed that the Triolin colored the breast feathers most markedly, but the head remained perfectly white. Red, in plumage, is often a very fleeting color, and Moseley found a South African stork whose brilliant rose-color was all washed out by a heavy shower of rain ! The seasonal red-color of the crossbill, the brown linnet and red pole disappears, changing to a greenish yellow in the bird first-named, while the carmine breast and forehead of the latter fades away altogether, like the dark blue of the Indigo bird's feathers, which assume a dingy brown color for the winter. Trophic colors, or tints due to food have been as yet little studied although the Cochineal insect is of great commercial value, owing to the red color of the food stored up in the body of the wingless female, of which 70,000 dried specimens, I am informed, go to make 1 lb weight of the dye material. The caterpillar of *Bryophila* is yellow when it feeds on *Lichen juniperinus*; but grey when subsisting on the grey *Lichen saxatilis*. Such instances undoubtedly exemplify trophic coloration. Allied to trophic coloration and yet distinct from it, is

that which may be distinguished as "*Physiological*" coloration. Thus the transparent colorless embryo bird acquires a pale pink tint, when red blood first begins to circulate through the rudimentary body. Red blood as in the *Chironomus* larva imparts color, as also does red blood and green blood in many Annelids. Doubtless the Chlorocruorin in the green blood has a physiological function similar to the Tetronerythrin in yellow sponges. Tetronerythrin converts oxygen into ozone. Oddly enough it is the substance to which the feathers of many birds owe their orange color. The Gephyrean *Bonellia* and the Coelenterate *Hydra viridis* owe their color to minute plant-like bodies filled with green chlorophyll granules. In many Planarians the same green particles occur and Professor Geddes proved that by them oxygen was liberated as indeed Dr. Joseph Priestley, towards the end of the eighteenth century, had discovered, finding that the carbondioxide in sunlight was broken up and the oxygen given off.* Some colors are "*Morphological*" or due to features in the anatomy of animals. Many shrimps appear patched with color. A dark patch in the cephalothorax is produced by the liver; and their viscera appear as color-masses. The longitudinal dark stripe down the back of the zebra follows the course of the spinal cord, while the white stripes on the face of the tiger coincide with the branches of the infra-orbital nerves.

Closely allied to physiological coloration is that which may be called "*Pathological.*" White animals such as white crows, hawks, peacocks,‡ moles, eels &c., are abnormal, and known as albinos. Usually the eyes are red owing to the absence of pigment in the retina, as in the rest of the body, though white cats may have blue eyes, are usually deaf, as Darwin found out, and as a rule are tom-cats as Lawson stated. A white hedgehog (*Erinaceus*) i. e. one with the usually brown acuminate spines as white as ivory, was found to lack the normal integumentary nerve twigs. Albinos are evidently abnormal in regard to their peripheral nerve supply.

* Brandt regards such green particles in animals as parasitic plants in the tissues, or rather commensals supplying oxygen to the host.

‡ The surface of the feathers in the white peacock shows the 'eyes' and usual pattern just as a black horse shows a dappled pattern or glistening spotted appearance.

The white or yellowish eels, occasionally found, owe the disappearance of color to nervous causes due to sex, and the enlargement of the eyes is connected with the same cause, of a nervous and emotional nature.

Psychological or, as I prefer to distinguish them "*Emotional*" colors, are apparently due to intense temporary nervous states, recalling the "pallor," or the "redness" in the human face due to fear or to anger respectively. The cuttle-fishes rapidly change color, becoming red, green, or yellow under different emotional states, which influence the nerves affecting the chromatophores or large pigment spots, and iridescent plates in the integument. A captive Octopus when annoyed by a goad assumes a deep crimson color as though red with rage. Many fishes assume the most varied, often extremely beautiful colors, when dying. The large moon-fish or opah (*Lampris luna*) exhibits flitting rainbow tints, while the 3-spined stickleback (the male at least) acquires a deep scarlet tint about the throat, and the sides glisten with golden green. The 10-spined stickleback (*G. pungitius*) becomes inky black about the throat and abdomen, paler on the sides, before death. Sex coloration may be included under the heading "emotional" and what is called "sexual selection" is probably wholly secondary and subordinate in spite of Darwin's famous observations on the subject. Some of the most gorgeously-tinted male animals known to me do not support Darwin's view. Certain Pacific salmon, for example, notably the sockeye (*Oncorhynchus nerka*) coming in from the sea are of a steel-blue color; but the males change to a bright rose pink or madder on approaching the spawning grounds. For hundreds of miles countless numbers of these brightly tinted fish may be seen crowding the great rivers of the West. In the shallow upper waters tens of thousands occur in the Fall like struggling armies of "gold fish," 200 to 1,000 miles from the sea. Swiftly through the water foaming over the pebbly shallows, the crowded male fish speed, and fight and kill each other, and the gorgeously colored victors assume greater brilliance under the excitement. Any selection by the more sober-tinted female fish is out of the question in the terrible turmoil and rush. Like the antlers of deer and other seasonal out-growths in various animals, the colors referred to are the physical and visible expression of emotional

excitement. *Seasonal* colors are of a different character. Thus the stoat, Alpine hare, Arctic fox, &c., change from the sombre summer hues to snowy white, the tail or ear-tips remaining black in some instances. The beetle, *Carabus auratus*, is dusky in winter, but green in summer, while the spring and summer broods of one butterfly, a *Vanessa*, are in great contrast as regards color, &c. The winter pupa emerges in spring as *Vanessa levana*, while the second brood emerging in summer is distinguished as *Vanessa prorsa*, the contrast in coloration being attributed mainly to temperature, just as melanism, or the appearance of dark forms of certain species is said to be due to temperature and moisture.

If animals have appreciation of colors as is certainly the case, there are types which must be classed as "*Aesthetic*" implying delight in or preference for certain tints and arrangements of color.

Lord Avebury proved that bees prefer blue colors and Professor Poulton has found other instances. Darwin satisfied himself that female birds prefer brilliantly tinted male birds; but this "sex selection" is only a particular form of "aesthetic preference." Aesthetic coloration affords some of the most enchanting examples known to the naturalist, and perhaps the acme is reached in the gorgeous male Nicobar pigeon, a native of Java and Sumatra, which glitters in the serried hues of emerald, gold and metallic blue, surpassing the wondrous colors of the parrots and birds of Paradise.

Parasitic colors are due to parasitism, and are usually sombre for protection's sake like some of the bird ticks; but the horse and deer ticks (*Trichodectes*) and others are striped down the dorsum. Many parasites especially entoparasites are opaque white, having lost all coloration, from their mode of life in the interior of their hosts. Their surroundings are dark like the cave animals. *Environmental* colors are a form of mimicry and ensure the safety of the possessors. They may be classed as passive or procryptic, the various flounders and shrimps, which most accurately resemble the sandy bottom, are examples. Others are active or anticryptic colors like those of the tiger, which is concealed by its stripes and thus able to spring unobserved upon its prey. Spiders and many predaceous creatures show anticryptic coloration.

Warning coloration, called sematic by Poulton, implies disagreeable features disguised, it may be, under a very beautiful exterior. The strikingly colored skunk can be mistaken for no other mammal, the wasps, and similar offensive insects and many gorgeous larvæ repel animals, which might by mistake attempt to prey upon them, and be stung or poisoned. Many brilliant tropical fishes are said to be poisonous and unsuitable for food. Their coloration, as Mr. A. R. Wallace expresses it, is "an outward sign" of their non-edibility.

Recognition colors no doubt aid animals to readily detect their own kind The white tail of the rabbit is believed to direct the young to follow their parents to safety when danger looms.

Mimicry involves not only protective colors, but also protective shape or form. The lappet moth, the stick insect, the leaf insect are familiar cases of color combined with striking form-resemblance. The mimicry is perfect.

It is clear that these types of color often overlap. Thus aesthetic and sex coloration may combine in the same examples. It may be that in some cases the coloration has as its end the destruction of the individual in the interest of the tribe. Thus the brilliant color of the male sockeye must attract the attention of bears, fish-hawks and other enemies. As a rule the number of males is excessive, their reduction is a benefit, hence they not only fight most fiercely and thus perish, but are exposed to numberless dangers by reason of their striking colors.

A vast series of examples of animal colors, must at present be classed as *indifferent*. Like the bright tints of marble or agate, or the colors of the diamond, they seem to serve no purpose. The gorgeously tinted Nemerteans living in similar surroundings are of the most various hues. The rose pink of the Arctic Pteropods serves no apparent end, for they are most tempting food for many animals. I have found Copepods of a rich emerald color, while others are reddish or brown. The solitary frog has a rich topaz eye, the young *Cottus* shows a St. Andrew's cross over its iris, and all these instances are difficult to explain. The palate of the orang outan is black, while that of the chimpanzee is bright

pink*. The gall-bladder is often emerald green, the peritoneal membrane, as in certain fishes,† is silvery, bespangled with yellow, black and red stars. It is difficult to understand these internal colors and there are multitudes of inexplicable examples of external color too, which offer problems for biologists to solve in the future.

BOTANICAL NOTE.

FRUIT AND SEED.

In Botany the word fruit signifies the enlarged and matured ovary, whatever its substance may be and whether fit to eat or not. It is sometimes difficult to decide when speaking of the small fruiting organs of some plants whether these are fruits or true seeds. In the Butercup, Sunflower, Borage, and Mint families, the seed-like bodies are really fruits, while in the Mustard, Pink, Pea and Evening Primrose families, they are true seeds. All of these are usually spoken of as seeds which is the term commonly used by seedsmen, farmers and others. Dr. L. H. Grindon, the eminent English botanist, in his "British and Garden Botany," makes the following concise distinction: "There is an infallible distinction between a fruit and a seed, however much they may resemble each other: The fruit always has *two* scars, one at the base, showing where it was attached to the peduncle, and another upon the summit, indicating the former presence of the style or stigma; but the seed has never more than *one* scar, indicating the point at which it was connected with the pod that contained it."

J. F.

* No less inexplicable is the curious fact, mentioned by Darwin, that in the hornbill, *B. bicornis*, the inside of the mouth is black in the male; but flesh-colored in the female.

†For example *Gastrosteus*.

CONTRIBUTIONS TO CANADIAN BOTANY.*

By JAMES M. MACOUN, Assistant Naturalist, Geological Survey of Canada.

XVIII.

MITELLA DIVERSIFOLIA, Greene.

Near Trail, Columbia River, B C., May 19th, 1902. No. 64,574.† (*W. Spreadborough.*) New to Canada.

HEUCHERA FLABELLIFOLIA, Rydb., N. A. Fl. XXII : 115.

H. parvifolia, Cat. Can. Plants 1 : 158 & 526.

All the Canadian specimens referred to *H. parvifolia* in our herbarium prove to be *H. flabellifolia*. They are from Milk River Ridge, Alta. No. 10,560; Cypress Hills, Alta. No. 8,514, and Crow Nest Pass, Rocky Mts. No. 20,167. (*John Macoun.*) Milk River Ridge, Alta. No. 8,515. (*Dr. G. M. Dawson.*)

HEUCHERA COLUMBIANA, Rydb., N. A. Fl. XXII : 116.

H. cylindrica, var. *alpina*, Cat. Can, Plants, 1 : 526 in part.

H. cylindrica, var. *ovalifolia*, Contr. Can. Bot. No. 6, p 5, in part.

Crow Nest Pass, Rocky Mts. No. 8,500. (*Dr. G. M. Dawson.*) Waterton Lake, Rocky Mts. No. 10,561; Eagle Pass, C. P. Ry., B.C. No. 8,503. (*John Macoun.*) Trail, Columbia River, B.C. No. 64,571. (*J. M. Macoun.*) Referred to *H. glabella* by Rosendahl, but apparently a good species.

SAXIFRAGA RUFIDULA, (Small).

S. occidentalis, Cat. Can. Pl.. II : 321 in part.

Micranthes rufidula, Small, N. A. Fl., XXII : 140.

Well characterized by the red-tomentose under-surface of the leaves. Described from specimens collected by Prof. John Macoun on Mount Finlayson, Vancouver Island, May

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†Specimens have been distributed from the herbarium of the Geological Survey under these numbers.

17th, 1887. Collected July 17th, 1887, on Mount Arrowsmith, V.I., and May 19th, 1893, on Parson's Mountain near Victoria, V.I., by Prof. Macoun. The specimens collected in 1887 formed part of the material upon which Watson based his *S. occidentalis*.

SAXIFRAGA LATA, (Small.)

S. occidentalis, Cat. Can. Pl., II : 321 in part.
Micranthes lata, Small, N. A. Fl., XXII : 145.

Described from specimens collected by Prof. John Macoun at Lytton, B.C., April 16th, 1890. Not rare west of the coast range. ‡

RIBES OXYCANTHOIDES, L. var. CALCIOLA, Fernald, Rhodora, VII: 155.

This variety resembles the species "but young branches, petioles and lower leaf surfaces permanently and densely white-tomentose." Collected or noted growing in calcareous soils in Bonaventure and Gaspé counties, Quebec, by Messrs. Collins, Fernald and Pease at the following places: Carlisle, Tracadigash Mt., mouth of Bonaventure River, New Richmond, Grand River, Percé, Little Cascapedia River and Dartmouth River. This variety was collected on "the island" Baddeck, Cape Breton Island, N.S., by Prof Macoun in 1898, Herb. No. 19,102. An intermediate form was collected on Cape Breton Island, the same same year at Grand Narrows, No. 19,100, and Big Intervale, Margaree, No. 19,101.

CRATAEGUS BRUNETIANA, Sargent.

A common species about Quebec. Our specimens were collected in fruit near Quebec in 1902 by Dr. Robt. Bell.

SPIRÆA SORBIFOLIA, L.

Escaped from cultivation and well naturalized on the bank of the Gatineau River at the railway station, Wakefield, Que., 1903. *(John Macoun)*

GEUM PULRCHUM, Fernald, Rhodora, VIII : 11.

Known in Canada only from specimens collected by Williams, Collins and Fernald in boggy meadows by the St.

‡The Geographical limits given in these papers refer to Canada only.

Lawrence River at Bic, Quebec, but will probably be found elsewhere. Characterized by its "large, wide-spreading crimson calyx, deep claret-colored styles and the strongly contrasting broadly obcordate bright yellow petals"; suggesting *Geum macrophyllum* in the outline of the leaf only.

MEDICAGO DENTICULATA, Willd.

Toronto, Ont. *(W. Scott.)* Not recorded from Ontario.

VICIA VILLOSA, L.

Camlachie, Ont, June 18th, 1901, No. 34,280. *(John Macoun.)* New to Canada, rare in North America. Introduced.

GERANIUM PRATENSE, L.

Roadsides and pasture fields, Wakefield, Que., 1903. *(John Macoun.)*

LINUM CATHARTICUM, L.

On the left side of the entrance road, Beechwood Cemetery, Ottawa, Ont., 1903 *(John Macoun.)* Not before recorded from Ontario.

EMPETRUM NIGRUM, L., var. ANDINUM, DC.

Distinguished from *E. nigrum* by its red fruit and tomentose or lanate young leaves. This plant was sent us from Newfoundland many years ago and was named *E. rubrum*. Mr. L. Fernald has shown (Rhodora, vol. IV: 147-151) that it is apparently identical with the Andes plant described by De Candolle.

RHUS VERNIX, L.

R. venenata, Macoun, Cat. Can. Plants, I: 100 and 505.

Abundant by the little lake west of East Templeman, Que., 1903. *(John Macoun.)* Not recorded east of S. W. Ontario.

IMPATIENS NOLI-ME-TANGERE, L.

On Kent street, Ottawa, Ont. Noticed there for several years previous to 1901, when flowering specimens were collected in September.

MALVA ALCEA, L.

Common by roadsides in Masham township near Wakefield, Que., 1903. *(John Macoun.)*

ANTHRISCUS CEREFOLIUM, Hoffm.

Roadsides at Cap à L'Aigle, Que. No. 67,994. *(John Macoun.)* New to Canada.

CICUTA DOUGLASII, (DC.) C. & R.

In marshes, Chilliwack Lake, B.C. No. 44,480. *(J. M. Macoun.)* New to Canada.

SANICULA NEVADENSIS, Wats.

Revelstoke, B.C., 1902. (*W. Spreadborough.*) Eastern limit in Canada.

MONOTROPA FIMBRIATA, Gray.

In woods near Trout Lake, B.C. (*E. Wilson.*)

GAULTHERIA HUMIFUSA, (Graham) Rydberg.

C. Myrsinites, Hook.

Mountains at Lake Agnes, No. 66,473, and at Pipestone Creek, No. 66,474, Rocky Mountains, 1904. (*John Macoun.*) Not recorded from Rocky Mountains since Drummond's time.

GLAUX MARITIMA, L. var. OBTUSIFOLIA, Fernald, Rhodora, IV: 215. *G. maritima*, Cat. Can. Pl. I: 315 in part.

With the exception of a single specimen from Assinaboine Rapids, Man., (*John Macoun*), our herbarium specimens of this variety are from either the Pacific or Atlantic coasts. In the east it is represented in our herbarium by specimens from Brackley Point, Prince Edward Island, No. 15,682; Grand Narrows, Cape Breton Island, N.S., No. 19,849; Salmon River, Que., No. 68,641, and Murray River, Que., No. 68,642 (*John Macoun*); Oak Island, Mahone Bay, N.S., No. 23,060 (*Dr. C. A. Hamilton*); Campbellton, N.B., No. 15,985 (*Dr. R. Chalmers*); Bathurst, N.B., No. 60,463 (*Williams* and *Fernald*); Cacouna, Temiscouata Co., Que., No. 67,057 (*Collins* and *Fernald*). From the Pacific coast,

Chase River, Vancouver Island, No. 15,981; Comox, Vancouver Island, No. 635; Burrard Inlet, B.C., No. 15,979 (*John Macoun*); Lacomb Island, Portland Canal, B.C., No. 14,978 (*J. McEvoy*): Renfrew District, Vancouver Island, No. 41,413 (*Rosendahl* and *Brand*).

DODECATHEON PUBERULUM, (Nutt.) Piper.

Grassy slopes, Penticton, Lake Okanagan, B.C. No. 61,247. (*W. Spreadborough.*) Damp spots at Trail, Columbia River, B.C. No. 66,531; west of Sophie Mt., B C. No. 66,532. (*J. M. Macoun.*)

CYNANCHUM VINCITOXICUM, R. Br.

Escaped from cultivation at Niagara Falls, Ont., 1904. (*W. Scott.*)

NEMOPHILA BREVIFLORA, Gray.

Very abundant on damp grassy slopes at an altitude of 5,000 feet, Sophie Mt., S.W. of Rossland, B.C. No. 66,614. (*J. M. Macoun.*) New to Canada.

POLEMONIUM ELEGANS, Greene, Pittonia. III: 305.

P. confertum, Cat. Can. Pl., II: 330.

Summit of South Kootenay Pass, Rocky Mountains. No. 16,221. (*Dr. G. M. Dawson.*) Summit of Sheep Mountain, Waterton Lake, Rocky Mountains. No. 11,807. (*John Macoun.*) Second summit west of Skagit River, near the International Boundary. Alt. 7,000 ft. No. 68,716. (*J. M. Macoun.*)

CYNOGLOSSUM BOREALE, Fernald, Rhodora, VII: 249

C. Virginicum, Cat. Can. Pl. I: 335 and 567.

C. occidentale, Cat. Can. Pl. I: 567, and II: 344.

This species is not uncommon in Ontario and eastward throughout the Maritime Provinces, but west of Lake Superior it is very rare. In our herbarium we have no specimens from the wooded country north of the prairie region, where it was collected by Drummond, nor have we any specimens from the Rocky Mountains. Our herbarium material from British Columbia is represented by specimens from Donald in the Columbia valley and from Vernon near Lake Okanagan.

ASPERUGO PROCUMBENS, L.

Waste places at Banff, Alta., 1903. (*V. B. Sanson.*) Not recorded west of Ontario.

VERBENA BRACTEOSA X STRICTA.

A *Verbena*, evidently a hybid between *V. bracteosa* and *V. stricta* was found growing very abundantly on dry sandy ground near Pt. Edward, Ont., Aug. 20, 1903. (*C. K. Dodge.*)

MERTENSIA OBLONGIFOLIA, Don.

Common on hillsides around Trail, Columbia River, B.C. Nos. 66,567 and 66,568. (*J. M. Macoun.*) New to Canada.

MERTENSIA CILIATA, Don.

South fork of Salmon River, near Idaho boundary. No. 66,566. 1902. (*W. Spreadborough.*) New to Canada.

TEUCRIUM LITTORALE, Bicknell.

Along the shore below Mahone Bay, N.S. (*Dr. C. A. Hamilton.*) New to Canada.

SCUTELLARIA NERVOSA, Pursh.

Dry open woods, Cedar Creek, Arner, near Kingsville, Ont. No. 54,679 (*John Macoun.*) New to Canada.

MENTHA ARVENSIS, L. VAR. LANATA, Piper, Bull. Torr. Bot. Club, XXIX: 223.

Size and habit of var. *Canadensis*, Briquet (*M. Canadensis*, L.) but the calyx, stem, petioles and often the whole underside of the leaf-blade densely lanate-pubescent.

Dry bed of torrent, Middle Creek, Chilliwack River, B.C. No. 54,657; bank of Chilliwack River, B.C. No. 54,656. (*J. M. Macoun.*) New to Canada.

SOLANUM CAROLINENSE, L.

Very abundant at Point Edward, Lake Huron. No. 54,531. (*John Macoun.*)

PHYSALIS PRUINOSA, L.

Streets of Southampton, Ont, No. 54,524. (*John Macoun.*) New to Canada.

VERBASCUM LYCHNITIS, L.

Roadsides at Sandwich, Ont. No. 54,510. (*John Macoun.*)

CHÆNORRHINUM MINUS, (L.) Lange.

Linaria minor, Desf.; Macoun, Cat. Can. Plants, 1 : 353. Contr. to Can. Bot. Pt. XII.

Kincardine, Ont. (*W. Scott.*) Point Edward. No. 54,467, and Sarnia Ont. No. 54,466; along the railway at East Templeman, Que., 1903. (*John Macoun.*)

PENSTEMON PULCHELLUS, Greene.

Rocky summits, alt. 6,000 ft., Tami Hy Mountain, Chilliwack Valley, B. C. 1901. (*Jas. M. Macoun.*) New to Canada. Probably not a good species but only a form of *P. procerus.*

PENSTEMON DIGITALIS, (Sweet) Nutt.

Another locality for this species is Farm Point, four miles from Cascade, Que. It is not easy to account for the occurrence of this plant as though generally treated as a garden escape it is found where there is no record of its having been cultivated.

CASTALLEJA SUKSDORFII, Gray.

Abundant on sub-alpine slopes between the Chilliwack River and Mount Cheam, B.C., alt. 4,000 ft. Nos 54,442 and 54,443. (*J. M. Macoun.*) Not recorded from Canada.

PLANTAGO ARISTATA, Michx.

Galt, Ont. (*W. Herriot.*) Roadsides near Windsor, Ont. No. 54,701. (*John Macoun.*) Introduced from the west, now well established.

PLANTAGO MEDIA, L.

Roadsides under the shade of the maples along the Whortley Road, near London, Ont. (*J. Dearness.*) Of very rare occurrence in Canada.

GALIUM BIFOLIUM, Wats.

Abundant on clay banks along the Dewdney Trail, west of Sophie Mt., B.C. Alt. 5,000 ft. No. 64,890. (*J. M. Macoun.*) New to Canada.

ANAPHALIS MARGARITACEA, B. & H. var. OCCIDENTALIS, Greene.

Characterized by its bright green leaves, glabrous above. Confined in Canada, apparently, to the vicinity of the Atlantic and Pacific coasts where it is rare. We have no specimens from the interior.

XANTHIUM GLABRATUM, (DC.) Britton.

In ditches by roadsides and along streams near Sarnia, Ont. (*C. K. Dodge.*) New to Canada. Mr. Dodge has also collected *X. Pennsylvanicum* at Port Huron, Mich., just opposite Sarnia.

XANTHIUM CANADENSE, Mill.

Typical specimens of *X. Canadense* were collected by Prof. Macoun by the mill at Blue-berry Point, near Aylmer, Que., in 1903. During the same summer he collected *X. echinatum*, Murr., at Wakefield, and *X. Pennsylvanicum*, Wall. near St. Patrick's Bridge, Ottawa.

GALINSOGA PARVIFLORA, Cav.

Toronto, Ont , 1904. (*W. Scott.*) First collected in Canada by J. Dearness in north London, Ont. in 1901 and more recently in the southern part of that city.

CHRYSANTHEMUM LEUCANTHEMUM, L.

Typical *C. Leucanthemum* as represented in our herbarium seems to be confined to the Atlantic and Pacific coasts our only specimens being from Newfoundland, No. 10,055, (*Robinson* and *Schrenk*) ; Boylston, N S., No. 22,830, (*Dr. C. A. Hamilton*) ; Big Intervale, Margaree, Cape Breton Island, N.S., No. 19,072, (*John Macoun*) ; New Carlisle, Bonaventure Co., Que., No. 69,071, (*Williams* and *Fernald*); Montmorency Falls, Que., No. 68,327, (*John Macoun*) ; Cedar Hill, Vancouver Island, B C., No. 14,503, (*John Macoun.*) The var.

subpinnatifidum, Fernald, Rhodora, v : is abundantly represented in the herbarium of the Geological Survey by specimens from Labrador to British Columbia.

ARTEMISIA BIENNIS, Willd.

Near the mouth of Albany River, James Bay, 1904. (*W. Spreadborough.*) Probably introduced.

ARNICA GASPENSIS, Fernald, Rhodora, VII : 148.

Described from specimens collected on ledges of a hill near Ste. Anne des Monts, Gaspé, in 1881, by Mr. J. A. Allen.

ARNICA PLANTAGINEA, Pursh.

Described from specimens collected in Labrador and recorded from several stations there. Re-described by Mr. Fernald, Rhodora, VII : 247.

ARNICA SORNBORGERI, Fernald, Rhodora, VII : 147.

Bank of a mountain brook at Rama, Labrador. (*J. D. Sornborger.*)

CARDUUS NUTANS, L.

In the pasture on the Pêche River above the schoolhouse at Wakefield, Que., 1903. (*John Macoun.*) Not recorded west of the Maritime Provinces.

CIRSIUM ARVENSE, Hoffm. var. SETOSUM, Ledeb.

In a second-growth woods about 200 yards from the Grand Trunk Railway at Lachine, Que., 1905. No. 67,797. (*Dr. Robt. Campbell.*)

CENTAUREA JACEA, L.

Waste places at Owen Sound, Ont., 1901. Herb. No. 26,445. (*John Macoun.*) New to Eastern Canada.

LEONTODON HISPIDUS, L.

Moist meadows, Galt, Ont., 1902. (*W. Herriot.*) New to Canada.

SONCHUS ARVENSIS, L.

Albany, James Bay. 1904. (*W. Spreadborough.*)

LACTUCA PULCHELLA, DC.

Mouth of Albany River, James Bay, 1904. (*W. Spreadborough.*) Not recorded from that region.

PRENATHES RACEMOSA, Mx.

The Beacon, mouth of Moose River, James Bay, 1904. (*W. Spreadborough.*) Not recorded from that region.

AGOSERIS ALTISSIMA, Rydb.

Prairies near Old Wives' Lake, north of Peace River, Atha., 1903. No. 61,242. (*J. M. Macoun.*) Known before only from type locality in Montana.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

At the annual meeting of the Entomological Society of Ontario held at the Ontario Agricultural College, Guelph, on the 10th and 11th October, three of the local members of the Club, Messrs. Fletcher, Gibson and Young presented papers, and, Dr. Fletcher, was honoured by being elected President of the Society for the ensuing year. Other members of the Club who contributed papers during the convention were Mr. J. D. Evans, of Trenton, Mr. H. H. Lyman, of Montreal, Prof. Wm. Lochhead, of the Macdonald Agricultural College, Ste Anne de Bellevue, Que., Mr. C. W. Nash, and Mr. J. B. Williams, of Toronto, and the Rev. Professor Bethune, of Guelph. Among the exhibits shown was a beautiful collection of exquisitely mounted tineid moths, collected and prepared by Mr. C. H. Young, of Ottawa. Mr. Young has been most energetic in the collection of these interesting little insects and during the past two years has mounted upwards of four thousand specimens. We hope, as Mr. Young is getting his material identified by the well known specialist, Mr. W. D. Kearfott, of Montclair, N. J., that he will publish in the OTTAWA NATURALIST, at an early date a list of the species he has found in the Ottawa district. One of the important features of the meeting was a full discussion on the habits of the Codling Moth and the best methods of controlling it. Mr. Paul Hahn of Toronto

delivered the popular lecture on "An Entomological trip to Algonquin Park"—This was illustrated by lantern slides from photographs taken during the trip.

A. G.

LIMNÆA MEGASOMA.

Limnæa megasoma is undoubtedly the finest of the pond shells of North America. In the vicinity of Ottawa it is found only in Meech's Lake, where it is least rare in a sheltered bay about two hundred yards north of the Tilley Cottage. The species occurs in many of the lakes of northern Ontario. It is abundant in both the outlets of Lake Temagami and is doubtless to be found in every bay of this beautiful lake. At the mouth of the French River and in the northwest arm of Lake Nipissing, it is quite common. But nowhere does it appear in greater numbers than in the centre of the new silver district— Cobalt Lake. Here with unnumbered millions in value of precious mineral surrounding it, *L. megasoma* flourishes, despite the large quantity of arsenic present in the water, and many of the mature shells preserve the rich brown tints which constitute the chief beauty of the young of the species.

F. R. L.

NOTE.

The undersigned would ask all members of the Field Naturalists' Club, who are so inclined, to send notes on birds which have been observed—where there is no doubt as to the facts given—as well as specimens for identification, and especially old nests of this year, together with data of the species that built it, in what location it was, etc., in to him. By co-operation of this kind much valuable information can be accumulated, which can afterwards again be made use of for the benefit of the whole club.

C. W. G. EIFRIG,
210 Wilbrod Street,
Ottawa.

NATURE STUDY No. XXXVIII.

School Exhibits of Pressed Plants.

By James Fletcher, Ottawa.

Largely as an outcome of the Nature Study movement, much attention has recently been given in rural schools to the formation of collections of various Natural history objects. The appreciation of the value of this work has found expression in the efforts made by the authorities of local Fairs and Exhibitions to encourage the teachers and scholars of their several districts, by offering prizes to be competed for under stated conditions. It cannot be doubted that the small expenditure involved has in the main been amply justified by the results. There are, however, some features of this work which may be advantageously considered by the teachers when themselves entering upon these competitions or persuading their scholars to do so. In this, as in every other kind of work, the first consideration should be: Is it advisable? If this is decided in the affirmative, then some definite idea should be formed beforehand as to the educational use the effort is to be put to and the way it is to be carried out. The writer has had many opportunities during the past ten years of examining and judging collections of plants, native woods and seeds, etc., which have been entered for competition at various Exhibitions. In most cases, there has been evidence of much energy, patience and care in making and preparing the specimens for exhibition; but there have also been signs that the makers of some of the collections have not quite understood the main principles involved in making a collection at all, or of making it educationally valuable. Most of the short-comings seem to have been due to a lack of knowledge of what the results of long experience, gathered from many different students, have shown is the best way to make a representative collection of natural history objects. It is with the hope of helping my many friends among the teachers and scholars of our country that I write this note. I believe that the encouragement of these natural history competitions, extended by Exhibition Associations, is a very wise one:—from their own point of view in the first place, the large number of visitors who invari-

ably crowd around these exhibits, bears testimony to the great interest in the subject, not only on the part of the friends of the exhibitors, but also among the general public; and, besides, it is highly commendable, because they are stimulating the study of branches of knowledge which are now acknowledged to be of the utmost importance, in finding simple means for preventing loss in the crops of the country and thus increasing enormously its revenues, as well as, at the same time, the prosperity and happiness of the individual citizen. Teachers and students may therefore feel quite justified in giving the necessary time and thought required in trying to learn the true nature of some of the common natural history objects around them. These to most minds will be found on closer acquaintance to be so attractive that they will stimulate further study and engender a craving for more knowledge concerning all similar objects. This will bring with it increased powers of observation and comparison, in short, a scientific attitude of mind which strives to see things in their true light, to think correctly, and to understand what is being considered. To do this will require much patience and mental self control. as well as great care to avoid jumping to hasty conclusions. It may be claimed, then, that this work is certainly useful, not only from an educational point of view because it demands close observation and thought, which train the mind and form character ; but also because the actual knowledge acquired is of use in the ordinary walks of every day life. A nature study may be defined as an educational exercise consisting of a careful observation of some common natural history object, together with a conscious mental effort to learn as much as possible of its nature and uses : —what it is, what it does, why it does it, how it does it, and what its relation is to man or more directly to the observer himself. In such an exercise it is convenient and often necessary to preserve specimens both of the objects under consideration and of similiar and allied forms, so as to have these at all times easy of access for study and comparison. This means to make a collection. In doing this, it is soon noticed that each kind of plant has its own habitat or special locality where it finds conditions most suitable to its highest development, and that, to find it in the best state for study, it must be sought for in those localities. For the

thorough understanding of a species, it is necessary to know the plant in all its parts and in all its different stages of development. Specimens should be collected illustrating all these points, and should be chosen, first of all, with an idea of presenting the average development and typical form of the species. Dwarfed or gigantic specimens should be shown only as indicative of the range of variation. There seems to be a tendency with beginners to collect specimens with unusually large leaves or flowers, which specially strike them, or dwarfed or imperfect specimens, "chips," which are easy to preserve and mount, but which give little information when referred to in a collection. Separate leaves or plants without flowers or fruit should not be included, unless these parts are otherwise shown. Each species should be represented, if its average size will permit of this, by a specimen showing the root, the stem, the leaves both from the root and on the stem, the flowers and the fruit. In large plants, as in the case of coarse-growing herbaceous plants, shrubs and trees, portions must be selected illustrating the various parts. In order that the collection may be of the greatest use, it is necessary to label carefully and neatly every specimen, giving the name, the habitat or nature of the place where found, the exact locality, so that if necessary further specimens may be collected, and the date of gathering, so that the time of flowering and seeding may be known. Valuable additions to a collection of plants are specimens of the seeds and of seedlings showing the seed leaves. In the matter of mounting and labelling, neatness and uniformity are very essential. Specimens should be dried quickly, so as to preserve the colour as much as possible, and in a natural manner, so that the flowers may take the same positions as when the plant was growing, and so that the undersides of some of the leaves may be seen. In preserving a plant, it should be neatly arranged, when first pressed, between the folds of a single sheet of thin paper, once folded. This should then be placed between driers of absorbent paper, which for a few days must be changed every day, and dry sheets substituted, without disturbing the plant in its folder. On the second day the specimens should be examined to see that all the characters of the plant are shown, and, if they are not, parts may be moved a little to improve the arrangement; but after that the specimen should not be disturbed until it is quite dry, when it may be taken out and mounted permanently on paper thick enough to allow of examination without breaking the specimen. Each plant should have a separate sheet to itself, and all the mounting paper in a collection should be of the same size and labelled in the same

place. The specimens may be attached to the mounting paper either by narrow strips of paper neatly stuck over the stems, or with liquid glue placed at several points on the firm parts of the underside of the specimen. The different sheets should be placed together in their botanical families in accordance with some recognized list. The "Catalogue of Canadian Plants" by Professor John Macoun, our highest authority, is universally followed in Canada. This catalogue can be procured from the Geological Survey Department at Ottawa. The sheets should always be kept separate and for a reference collection for a school, after being displayed at the local exhibition, should be carefully put away in a neat box made a little larger than the size of the mounting sheets. Specimens of plants should never be put in bound books, nor should the sheets be caught together at the edges, with cords as is sometimes done. In both of these ways, the specimens are easily broken, there is no way of interpolating in their proper places species subsequently collected, it is inconvenient to examine and compare the species, and, when the collection is required for an exhibition, it cannot be displayed in an attractive manner, which is an important point with the exhibition authorities.

In order that these collections may be of the greatest educational value, the specimens should be gathered as much as possible by the students themselves, and the name of the collector should appear on the label. The teacher should merely help in identifying and comparing the plants with related forms and also in showing how to prepare the collection for exhibition.

Collections of the seeds of weeds make an attractive and useful exhibit. Owing to the good work of the Seed Branch of the Department of Agriculture under the direction of Mr. G. H. Clark, great interest has been recently developed in recognizing the various weed-seed impurities in crop seeds offered for sale. Farmers are now alive to the importance of knowing the appearance of the seeds of these enemies which in the past they so often carried on to their land, mixed with the seed they sowed for crop. All of the weed seeds have characteristic shapes, colours and markings, by which after a little practice they are just as easily recognized as the crop seeds among which they occur. In making collections of weed seeds, the appearance of those of the worst pests is soon learnt, and the boys and girls of Canada have a grand opportunity of using their sharp eyes to the advantage of their fathers, by examining the seeds bought for sowing and finding out whether any weed seeds are included.

Seed collections should be exhibited in small bottles, all of the same size, neatly labelled in the same place on each bottle. Well cleaned seed, as well as some in the husk should be shown.

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THE CRYPTOGAMIC FLORA OF OTTAWA.*

By JOHN MACOUN, Naturalist, Geological Survey of Canada.

(Continued from THE OTTAWA NATURALIST, Vol. XXI, p. 100.)

MUSCI.

2. SPHAGNUM GIRGENSOHNII, var. HYGROPHILUM, Warnst.

In wet woods at Casselman, Sep. 16, 1898.

7. SPHAGNUM CUSPIDATUM, var. SUBMERSUM, Schpr.

Ditches in the Mer Bleue at Eastman's Springs, June 16, 1892 ; also at Blackburn Station, June 20, 1902.

17. WEISIA VIRIDULA becomes W. RUTILANS, Hedw.

And the references with it.

17*a*. WEISIA RUTILANS var. GANDERI, Juratzka.

On earth on old stumps subject to flood, by Lake Duchesne above Britannia, Oct. 27, 1900.

427. TREMATODON AMBIGUUS, Hedw.

On wet earth at Casselman and South Indian, June, 1898 ; in fine fruit on the road that passes along the north side of Beechwood Cemetery, Oct. 10, 1900.

428. DICRANELLA SQUARROSA, Starke.

In wet springy places south of the canal and along the railway west of Dow's swamp. July 6, 1900.

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† The numbers above 426 are in continuation of the list. The references under smaller numbers are to species already listed.

429. DICRANUM LONGIFOLIUM, Hedw.

On boulders at the head of Meach Lake, on the west side. Sept. 23, 1893.

430. DICRANUM DRUMMONDII, C. Muell.

In fine fruit in a cedar swamp a little east of Stittsville. June 10, 1903.

431. FISSIDENS ADIANTOIDES LINN. var. INSTATUS, Kindb.

On old stumps subject to flood along Lake Duchesne above Britannia. Oct 27, 1900.

432. FISSIDENS SUBBASILARIS, Hedw.

On cedar bark at the base of a tree in old woods at Carleton Place. May 12, 1900.

433. FISSIDENS GARBERI, Lesq. & James.

On earth on old stumps, subject to flood along Lake Duchesne above Britannia. Oct. 27, 1900.

434. BARBULA SUBULATA, (Linn.)

Crevices of limestone rocks near Governor's Bay, Rockcliffe Park. May 16, 1900.

435. GRIMMIA PSEUDO-RIVULARIS, Kindb.

Our rocks at the Cascades and at Paugan Falls on the Gatineau River.

435*a*. GRIMMIA PSEUDO-RIVULARIS, SUB. SP. LANCIFOLIA, Kindb.

On rocks at Meach Lake. Sept. 23, 1893.

436. GRIMMIA CONMUTATA, Hueben.

On rocks along the Gatineau River above the Cascade Rapids. June 22, 1900.

437. BARTRAMIA GLAUCO-VIRIDIS, C. M. & Kindb.

On Meach Lake, Que. Sept. 23, 1893.

72. PHILONOTIS FONTANA, Brid.

By springs along the railway, south of the railway and west of Dow's swamp, July 6, 1900; also in the swamp by the Beaver Meadow, Hull, Que. June 21, 1900.

438. WEBERA CRUDA, Schimp.

On rocks in cuttings of the Gatineau Railway above Chelsea; on rocks at Cascade, Gatineau River. June 22, 1900.

439. BRYUM FERCHELII, Funck.

On rocks near the water above the old mill at Cascade, Gatineau River. June 23, 1900.

440. MNIUM GLABRESCENS, Kindb var. CHLOROPHYLLOSUM, Kindb.

On wet rocks in a brook emptying into the west side of the north end of Meach Lake, 4 miles above Old Chelsea, Que. Sept. 23, 1893.

441. MNIUM RIPARIUM, Mitten.

On wet rocks by the small brook in Rockcliffe Park. April 16, 1899.

442. ATRICHUM ANGUSTATUM, Bruch & Schimp.

On sandy and damp earth by the roadside on the north side of Beechwood Cemetery. Nov. 2, 1899.

100. POGONATUM BREVICAULE, Beauv.

On a damp sandy bank on the north side of Beechwood Cemetery, in fine fruit. Oct. 10, 1900.

101. POGONATUM ALPINUM, Roehl.

Crevices of rocks at Meach Lake, Sept. 23, 1893; also amongst rocks near Wakefield, Que. July 20, 1803.

443. FONTINALIS HYPNOIDES, Hartm.

On trees subject to flood along Lake Duchesne above Britannia. Oct. 27, 1900.

132. PTEROGONIUM BRACHYPTERUM, Mitt.

On ironwood trunks near Hemlock Lake, Beechwood. May 16, 1900.

444. ANOMODON PLATYPHYLLUS, Kindb.

On trees in the swamp west of Fairy Lake, Hull, Que. Oct. 20, 1902.

445. PYLAISIA POLYANTHA, Br. & Schimp, var. RUPESTRIS, Best.

On a boulder in woods on the east side of the Beaver Meadow, Hull, Que. May 3, 1902. New variety.

446. PYLAISIA PSEUDO-PLATYGYRIUM, Kindb.

On old logs at Leamy Lake, near Hull, Que. Nov. 9, 1896.

ENTODON MACOUNII, C. M. & Kindb.

On an elm log in swampy woods Billings' Bush (Rideau Park), April 28, 1900; on earth near Hogsback, Rideau River. May 2, 1897.

THUIDIUM VIRGINIANUM (Brid.) Lindb.

On old logs west of Hull, and east of Beaver Meadow, Que. April 30, 1902.

449. THUIDIUM PHILIBERTI, Limpricht.

On the bases of trees on the hills west of Cascade, Gatineau River. June 23, 1900.

450. THUIDIUM PSEUD-ABIETINUM, Kindb.

On earth on a swamp at Britannia. Sept. 11, 1890. Referred in No. 139 to *J. Blandowii*.

142. BRACHYTHECIUM DIGASTRUM, C. M. & Kindb.

On rocks by the Gatineau River above Cascade, Que. June 23, 1900.

451. BRACHYTHECIUM CYRTOPHYLLUM, Kindb.

In holes in elm trunks in old wood at Carleton Place. May 12, 1900.

452. BRACHYTHECIUM LÆVISETUM, Kindb.

On the bases of trees, Blueberry Point, Aylmer, Que. April 17, 1900.

453 BRACHYTHECIUM ALBICANS, Br. & Sch.

On earth in woods, by Leamy Lake, Hull, Que. Nov. 9, 1896.

454. Brachythecium harpidioides, C. M. & Kindb.

On earth in woods at the head of Hemlock Lake, near Beechwood Cemetery. May 16, 1900.

455. Brachythecium Hillebrandi, Lesq.

On old logs in old woods, Carleton Place. May 12, 1900.

456. Brachythecium biventrosum, Muell.

On old logs in old woods at Carleton Place. May 12, 1900.

457. Brachythecium calicareum, Kindb.

Abundant on flat limestone rocks in Rockcliffe Park, Oct., 1892 ; May, 1899 and June, 1900.

458. Eurhynchium subscabridum, Kindb.

On limestone rocks on the west side of the Beaver Meadow. May 16, 1896.

211. Plagiothecium brevipungens, Kindb.

On old logs, Johnstone Lake, North Wakefield, Que., June 2, 1898 ; also on old logs, in old woods at Carleton Place. May 12, 1900.

459. Amblystegium pseudo-confervoides, Kindb.

On flat limestone rocks north of the Experimental Farm, April 16, 1893 ; on limestone rocks west of the Beaver Meadow, Hull, Que., April 25, 1899 ; also on the same habitat along the railway a little south of Carleton Place. May 12, 1900.

460. Hypnum longinerve, Kindb.

In pools in woods, west of Victoria Park and north of the Parry Sound Railway. June 19, 1900.

461. Hypnum perichætiale, Br. Eur.

On boulders in woods near Hemlock Lake. Sept. 29 1891.

462. Hypnum nemorosum, Koch.

On earth by Leamy Lake, Hull, Que. Nov. 9, 1896.

212. HYPNUM RICHARDSONI (Mitt.) Lesq. & James.

In a bog, Johnstone Lake, near North Wakefield, Que. June 2, 1898.

463. HYPNUM CUSPIDATUM, Linn.

In a springy place along the railway south of the canal and west of Dow's swamp July 6, 1900.

HEPATICÆ.

260. PELLIA EPIPHYLLA, Corda.

On earth by a brook below South Indian. June, 8, 1900.

463. NARDIA CRENULATA (Smith) Lindb.

On earth by the discharge of Leamy Lake, Hull, Que. Sept. 16, 1883.

232. LOPHOZIA HELLERIANA, (Nees.)
Cephalozia divaricata, Dumort.

On old logs in a swamp north of the Experimental Farm. April 16, 1892.

463*a*. ODONTOSCHISMA DENUDATUM, (Nees.)

On an old log in woods at Navan Station. Apr. 17, 1902.

464. SCAPANIA IRRIGUA, (Nees) Dumort.

In the north side of the Mer Bleue below Blackburn Station on the C.P.R. June 20, 1902.

465. PORELLA PINNATA, Linn.

On the bases of trees subject to flood, shore of Lake Duchesne above Britannia. Oct. 27, 1900.

222. COLOLEJEUNEA BIDDLECOMIÆ, (Aust.) Evans.
Lejeunea calcarea, Libert.

On the bark of white cedar in a swamp west of Fairy Lake, Beaver Meadow, Hull, Que. Oct. 20, 1902.

LICHENES.

466. RAMALINA CALICARIS, (Linn.) var. FRAXINEA, Fr.

On balsam fir at Stittsville. May 16, 1899.

467. PARMELIA CETRATA, Ach.

On an elm trunk in a swamp at Carleton Place. May 12, 1900.

468. PHYSCIA TRIBACIA, (Ach.) Tuckerm.

On black ash trees along Lake Duchesne above Britannia. Oct. 27, 1900.

469. PHYSCIA OBSCURA var. ENDOCHRYSEA, Nyl.

On black ash trees south of Cowley Farm. April 18, 1895,

470. LEPTOGIUM MYOCHROUM, Ehrh. Tuckerm.

On rocks, McKay's woods, April 16, 1891, and on King's Mountain. May 22, 1897.

471. PLACODIUM CERINUM var. PYRACEA, Nyl.

On old cedar trunks in Dow swamp. May 2, 1896.

472. PLACODIUM VITELLINUM var. OCTOSPORUM, Nyl.

On rocks near Hogsback, four miles from Ottawa, May 2, 1896 ; on bark of cedar rails south of Beechwood Cemetery. April 14, 1897.

473. LECANORA SUBFUSCA, var, DISTANS, Ach.

On bark of beech trees, McKay's woods, Ottawa. April 16, 1891.

474. LECANORA SUBFUSCA var. MINOR, BRANTH.

On limestone rocks near the Hogsback, four miles from Ottawa. May 2, 1896.

475. LECANORA VARIA var. POLYTROPA, Nyl.

On limestone rocks, Blueberry Point, Aylmer, Que. April 25, 1900.

476. LECANORA CENISIA, Ach.

On limestone rocks, along the Rideau River, near Hogsback, four miles from Ottawa. May 2, 1897.

477. LECANORA CINEREA, (Linn.) Sommerf.

On limestone rocks, along the Rideau River, near the Hogsback. May 2, 1897.

478. LECANORA GIBBOSA, Nyl.

On flat limestone rocks, Blueberry Point, Aylmer, Que. April 25, 1900

479. LECANORA CALCAREA, (Linn.) Sommerf.

On limestone rocks along the Rideau River below Hogsback. May 2, 1897.

480. LECANORA LAXA, Branth (Ms.)

On limestone rocks along the Rideau River below Hogsback. May 2, 1897.

481. LECANORA FUSCATA (Schrad.) Th. Fr.

On limestone rocks along the Rideau River at Hogsback. May 2, 1897.

482. RINODINA SOPHODES var. EXIGUA, Fr.

On limestone rocks in Rockcliffe Park, April 17, 1895; also along the Rideau River at Hogsback. May 2, 1897.

483. PERTUSARIA PUSTULATA, (Ach.) Nyl.

On old cedar rails on the road to Kingsmere north of Aylmer, Que. May, 22, 1897.

484. BIATORA COARCTATA, (Nyl.) Tuckerm.

On limestone rocks at Britannia. April 20, 1895.

485. BIATORA RIVULOSA, (Ach.) Fr.

On bark of living beech trees in Rockcliffe Park and at Billings' Bridge. April 19, 1898.

486. BIATORA ATROPURPUREA, (Mass.) Hepp.

On beech bark near Hemlock Lake, near Beechwood Cemetery. Sept. 6, 1891

487. BIATORA CYRTELLA, (Nyl.) Tuckerm.

On the bark of *Alnus incana* near Hogsback, May 2, 1897; on young maples in Billings' Bush, April 28, 1900.

488. BIATORA GLOBULOSA (Floerk.) Hepp.

On poplar bark in Stewart's Bush, Ottawa. April 13, 1895.

489. BIATORA MICROCOCCA, Koerb.

On old cedar rails (*Thuya occidentalis*) west of the old toll-gate, Aylmer Road, Hull, Que , Oct. 6, 1898.

490. BIATORA MELÆNA (Nyl.) Tuckerm.

On old and charred cedar rails along the Richmond Road, west of Ottawa, April 18, 1896.

491. BIATORA BECKHAUSII, (Koerb.)

On old fence-rails west of the old toll-gate on the Aylmer Road, west of Hull, Que., Oct. 6. 1898.

492. LECIDEA PRUINOSA (Smith) Flot.

Quite common on granite boulders in many places around Ottawa, April, 1897.

493. LECIDEA LAPICIDA (Ach) Nyl.

On limestone shingle near Hogsback by the Rideau River, May 7, 1897 ; quite common on limestone rocks everywhere around Ottawa.

494. LECIDEA CONTIGUA, Fr.

On limestone rocks, Blueberry Point, Aylmer, Que., April 25, 1900.

495. LECIDEA ENTEROLEUCA, Fr.

On small limestone pebbles at Britannia, April 25, 1895 ; also on pebbles, Blueberry Point, Aylmer, Que. April 25, 1900.

496. LECIDEA ENTEROLEUCA, Fr. var. PILULARIS, D C.

On limestone rocks along the Rideau River below Hogsback, May 2, 1897 ; on limestone shingle, Blueberry Point, Aylmer, Que. April 25, 1900.

497. LECIDEA PLANETICA var. PERFECTA, Eckfeldt.

On limestone shingle at Britannia, April 20, 1895.

498. BUELLIA SPURIA, (Schær.) Arn.

On limestone rocks in woods near Hull, Que. April 24, 1897.

499. BUELLIA PETRÆA (Flot.) Tuckerm.

On granite boulders near Governor's Bay, Rockcliffe Park, Ottawa, April 17, 1895.

500. BUELLIA OBSCURATA, (Ach.)

Quite common on limestone and other rocks around Ottawa; also at Blueberry Point, Aylmer, Que. April 25, 1900.

501. OPEGRAPHA VULGATA, Ach.

On ash bark near the Rideau River, at the Hogsback; also at Leamy Lake, Hull, Que. May 7, 1897.

502. GRAPHIS SCRIPTA, var. SERPENTINA, Ach.

On bark of *Juglans cinerea* in woods west of Hull, Que., April 24th, 1897.

503. CALICIUM PUSILLUM, Flœrke.

On old rails along the road leading from Aylmer to Kingsmere, Que. May 22, 1897.

504. SAGEDIA CESTRENSIS TUCKERM.

On the bark of young maples at Ottawa; also on Kings' Mountain above Chelsea, Que. May 22, 1897.

505. VERRUCARIA RUPESTRIS, Schrad.

On limestone rocks on the cliffs along the Ottawa, Rockcliffe Park, Nov. 11, 1896.

506 VERRUCARIA EPIDERMIDIS FORMA PUNCTIFORMIS, Branth.

On living alder stems along the Rideau River, near Hogsback, April 30, 1897.

507. PYRENULA PATELLARÆFORMIS, Eckfeldt.

On the bark of living black ash in Billings Bush, April 19, 1897.

508. PYRENULA LEUCOPLACA (Wallr.)

On bark of young maples in woods near Hull, Que., May 5, 1897.

509. PYCNIDES VERSIMILIDE, Branth.

On black ash bark in Billings Bush, April 19, 1897.

A VISIT TO DUCK ISLAND.

The glorious sun of a September afternoon shone warmly on a group of club members who recently visited Duck Island, the metropolis in the vicinity of Ottawa of the elusive unionidae, vulgarily called clams. The weather was delightful. The water was very low and unruffled and collecting was consequently easy and rapid. The many sand bars which project from the centre of the island towards Templeton wharf yielded the first fruits in fine specimens of *Unio occidens* and *Unio borealis*. A little lower *U. complanatus* was found in abundance. Few however of the specimens were of the very large, rayed form, for which the locality is particularly noted. But certain of the shells procured quite equalled the first found in 1881, which for a quarter of a century have increased in loveliness, and form the chief glories of the writer's cabinet. The heavy, inflated, unrayed form of *complanatus*, not occurring elsewhere than at the island, was very numerous, and some fine shells were selected from the thousands whose circular tracks furrowed the sand in every direction, always however with an ultimate trend to deep water. *U. ellipsis*, of small size was common, but there were few mature shells. This species is known in the Western States as "the nigger toe-nail", and is much used in the pearl button industry. Another shell of economic use, which occurred sparsely, is *U. rectus*, called by pearlers the "black sand-shell."

U. gibbosus was not uncommon, but not one afforded a mate for the fine pearl found six years ago in a shell of this species collected at the foot of the island. Several large *U. gracilis* were noticed, and a few shells of medium size saved. Of our only other winged shell, *U. alatus*, a single fine specimen was obtained. *U. alatus* and *U. rectus* are remarkable among North American unios for their extensive range—Quebec to Manitoba, and southward far into the Mississippi Valley—and for their constancy of form, under the widely differing conditions of their environments. A few specimens of *Anodonta undulata* were found, and a single fine *A. Benedictii*—the third living shell noted in more than twenty years. The others were found at the mouth of Brigham's Creek. Of the Margaritanas but one was noticed—*M. undulata*.

The shells of this species found at Duck Island are far more beautiful than any shells of the kind found elsewhere. But to *U. occidens* the prize of Paris must be given. Never probably in any place were so many beautiful fresh water shells obtained in the same brief time as were found on that September afternoon. There were thousands of *U. occidens* to select from, and many of those left to increase and multiply were abandoned with something of the regret one would feel who was compelled to leave fine pearls behind because one could not carry more away. Red occidens—huitres rouges—of our boatman, were very numerous, and from this deep and prized tint the changeful species ran the chromatic scale through every shade of orange, yellow and lemon, diversified always with deep green rays, now broad, now narrow, sometimes sparsely, oftener closely set.

The results for the day were upwards of six hundred selected shells of the following species :—

Unio complanatus, Sol.
U. borealis, A. F. Gray.
U. occidens, Lea.
U. ellipsis, Lea.
U. alatus, Say.
U. gracilis, Barnes.
U. rectus, Lamarck.
U. gibbosus, Barnes.
Margaraitana undulata, Say.
Anodonta undulata, Say.
A. Benedictii, Lea.

No attempt was made to secure *A. fluviatilis* from the pond on the island, nor were any of our smaller shells collected.

F. R. L.

THE FULVOUS TREE-DUCK.

In September, 1905, Mr. J. S. Rollins saw eleven fulvous tree-ducks, (*Dendrocygna autumnalis*) on the flats near New Alberni, Vancouver Island and shot five of them. One specimen is in the provincial museum at Victoria. This is the first record for this bird in Canada. W. SPREADBOROUGH.

Victoria, B. C.

AN ADDITION TO OUR MANITOBA WARBLERS.

While in the woods on the afternoon of October the 17th, on the lookout for the last individuals among birds moving south I observed a stranger which the white patches at the base of the primaries enabled me to recognize at once as a Black-throated blue warbler (*Dendroica caerulescens*) young male. It was flying about near the ground among tall aspens and was afterwards followed into thickish willows. In company with it were three golden-crowned kinglets and a couple of slender-billed nuthatches. This warbler was very active in spite of the coldness of the day and lateness of the season—it was also rather shy.

The black-throated blue warbler is not uncommon in most parts of eastern Canada where it breeds, but it has not hitherto been recorded for Manitoba, though from the bird observed being a young one it might be interred that this species breeds in the province or further north.

In Chapman's "Color Key" the range of this species is given as "Eastern North America, breeds from northern Connecticut, mountains of Pennsylvania, southern Michigan and northern Minnesota, north to Labrador and Hudson Bay region; winters in Central and South America".

NORMAN CRIDDLE.

Treesbank, Manitoba,
October 30th, 1906.

CECROPIA EMPEROR MOTH.

I have been shooting for many years at the "St. Clair Flats", Kent County, Ontario, but it was only about fourteen years ago that the cocoons of the above moth were first seen in great numbers at St. Ann's Shooting Preserve, which lies between the E'Carte and Johnston's Channels. A very few willow trees and bushes grow on the ridges out in the marsh and on some of these I found the cocoons. In one instance there were about fifty (50) on one willow, of about 14 inches diameter in the trunk and at another time I found about thirty-five on a small swamp willow bush about 6 feet high, and also attached to the marsh or prairie grass under or near said bush. Our club house is situated about

three miles out in the Marsh and surrounded by a grove of large willow trees but I have never been able to find a cocoon on any of them.

In 1900 they were particularly abundant and I sent to Ottawa a box of the large cocoons which were spun among the grasses around the base of a small willow tree. Regarding the food of Cecropia, neither I, nor my friend the late Mr. Warren, who used to accompany me on my shooting trips, could find any plants in the neighborhood with berries on them, such as we knew this caterpillar to feed upon, so we came to the conclusion that the food of the caterpillars must be the leaves of the willows and other small bushes in the neighborhood.

Since the time when I sent the cocoons, the insect seems to have deserted the locality altogether, for I have hunted the same places on the St. Clair Flats, and particularly on the willow trees but have been unable to secure even a single specimen.

I was much pleased with the interesting Nature Study article by Mr. Gibson in the October number of the OTTAWA NATURALIST. Such articles do much to draw the attention of many people who want to know about them, to these beautiful and common things which make excursions into the country so charming.

JOHN MAUGHAN, Toronto.

NOTE.—The cocoons sent by Mr. Maughan were of remarkable size. They were for the most part spun among the loose grasses at the base of the willows and many of them measured 4 inches long by 2 inches wide.—J. FLETCHER.

NOTE ON THE "TEAL WEED" OF ST. CLAIR FLATS.

By JOHN MAUGHAN, Toronto.

This plant which has been identified as the Common Floating Pond-weed, *Potomogeton natans*, is to be found in all sections of Ontario, and grows in large quantities in the bays, channels and ponds in the St Clair Flats, County of Kent, in water from six inches to six feet in depth. Among duck shooters this plant goes by the name of "Teal Weed" from the fact that the Green Winged Teal, *Anas Carolinensis*, the Blue Winged Teal, *Anas discors*, the

Baldpate, *Anas Americana* and the Pintail, *Dafila acuta*, all known as Marsh Ducks, feed on the seeds. The soft portion of this root and the small bulb which forms at the extremity of the roots of the Arrow-leaf (*Sagittaria*) are favorite foods of the Canvas back, *Aythya vallisneria*, and of the Redhead, *Aythya Americana*. These ducks dive in quite deep water to get the roots and tubers they feed upon, for this reason they are known as River Ducks. The Redhead and Canvas back feed also on what we call the Black rush, by which I mean the round green rush that grows in deep water. They take hold of the rushes and pull them out, thus securing the ripe brown seeds. They then leave the rush without breaking it. In the fall season quite a lot of the remains of the weeds which the ducks have pulled up may be found floating about and lying against the adjacent shores, where portions are eaten by other ducks and water hens. The River Ducks seem to seek the Arrow-leaf roots just as eagerly as they do those of the so-called "Wild Celery" (*Vallisneria*), both being excellent food for the birds.

REVIEW.

STUDIES OF PLANT LIFE IN CANADA, by Catherine Parr Trail, pp. 219. William Briggs, Toronto, Ont., $2.00.

This long-expected re-print of Mrs. Trail's fascinating book was received too late for a full review in this issue of the OTTAWA NATURALIST, but its appropriateness as a Christmas remembrance from one Nature lover to another is such that the attention of our members should be drawn to it at this time. Mrs. Trail spent the greater part of a long life in the backwoods of Canada and, always a lover of flowers, she has included in her book a record of all that she found most interesting or attractive in them. Mrs. Chamberlain's exquisite drawings with which the work is illustrated in half-tone and color add much to its beauty and value. The original edition was revised and edited by Dr. James Fletcher, and in preparing the present edition for the press Mrs. Chamberlain has had advice from both Dr. Fletcher and Prof. Macoun.

THE OTTAWA FIELD NATURALISTS' CLUB

PROGRAMME OF WINTER SOIRÉES, 1906-7.

1906.

Dec. 6th—The President's Address.

Address by Dr. J. F. White, Principal of the Normal School.

An Entomological Excursion in the Selkirk Mountains—by J. Chester Bradley, Berkeley, Cal., presented by Dr. James Fletcher, (illustrated by lantern slides).

Demonstration Exhibition—in Zoology, Ornithology, Entomology, Botany, and Geology, in charge of Prof. Prince, Rev. C. G. Eifrig, Dr. James Fletcher, Prof. John Macoun, Dr. H. M. Ami, and others. (In the Normal School).

1907.

Jan. 8—*Demonstration on the Physics of the Atmosphere*—By D. A. Campbell, B. A. (In the Hall of the Carnegie Library).

Jan. 22—*The Relation of Climate to Health*—By Dr. P. H. Bryce, Chief Medical Officer of the Department of the Interior. (In the Hall of the Carnegie Library).

Feb. 12—*The Physical Conditions of Life in the Deep Seas*—By Dr. R. A. Daly. (In the Hall of the Carnegie Library).

Feb. 26—*The Macdonald College*—By Dr. James W. Robertson. (In the Normal School).

Mar. 12 *The Forestry Problem in Canada* -By Elihu Stewart, Esq., Superintendent of Forestry. (In the Normal School). Illustrated.

Mar. 19—**Annual Meeting.**
Reports of Branches. Election of Officers and transaction of business. (In the Hall of the Carnegie Library).

All the Lectures are Free and Open to the Public.

NATURE-STUDY No. XXXIX.

AGENCIES FOR THE PROMOTION OF NATURE-STUDY IN CANADA.

By Prof. W. LOCHHEAD, Ste. Anne de Bellevue, Que.

It may appear strange to some that the Nature Study Movement should be able within a few years to gather the strength and take the hold that it now has in many of the provinces. While there are many persons opposed to assigning to Nature-Study the most prominent place in the time-table of the junior classes in our public schools, there are but few who oppose the study of nature by the children.

It may be truly said in the first place that the time was ripe for such a movement. For generations the natural sympathies of the child towards nature were smothered; and as a result he saw but little that was beautiful in the world about him. For generations the child was educated as a thing apart from his surroundings. Educationists had forgotten, or were ignorant of, several pedagogic principles, viz:—the senses are the avenues to the mind, and the sense perceptions give rise to definite knowledge in the mind—*Nihil in intellectu quod non prius in sensu*—new thoughts can be comprehended only by the help of old thoughts; the greater the stock of ideas possessed by the child, the greater the progress the child will make in the acquisition of knowledge or new ideas; the best development is self-development, by the encouragement of the activities of the child in the investigations of the problems presented to it; and education does not consist in the imparting of information by the teacher and its reception by the pupil. According to the modern idea it is all important that the child should have clear percepts of the things that constitute its environment, for these percepts form the basis for thought and further educational development.

But, while the schools were doing unsatisfactory work, there were several agencies in operation, which, unconsciously in some instances, were performing important educational service by encouraging many to undertake the study of natural history. The first of these were the Natural History and Field Naturalist Societies—the Montreal, Ottawa, Hamilton, Wellington, being perhaps

the most energetic,—and the Entomological Society of Ontario, with its branches in Montreal, Quebec, Toronto, Guelph and Vancouver. The influence of these Societies was quite marked, as many of the members were persons of note in their respective districts, and many young men received their first impetus to study nature at their meetings. Besides, the annual reports of some of these Societies, containing illustrated articles, were distributed freely throughout the country, diffusing much useful nature knowledge among the people.

While the Natural History Societies were quietly diffusing useful knowledge among the masses, and inspiring many persons with a desire for the study of nature, the Science teachers of the High Schools and Academies were also opening the eyes of their pupils to the wonderful things of Nature. For many years, it is true, the biology course as laid down in the syllabus for high schools did not tend to make nature students; but in later years the courses were more rational, and many young persons were roused to take an interest in natural history. The great majority of the Science teachers are enthusiastic nature students, and are doing much to encourage the newer movement by their personal work and influence.

The Normal Schools have for many years given courses in Science, but perhaps with too little emphasis on the biological side, with the result that the teachers on graduation were but slightly interested in the great nature-world around them. For the last five or six years, however, more attention has been given to Nature-Study, and most of the new teachers now begin their work with a high opinion of its educational value. To such men as Dearness, Elliott, Scott, Sinclair, and Brittain of the Normal Schools we are indebted for the development of the pedagogical side of Nature-Study, and for their efforts in demanding the rightful place for Nature-Study on the school curriculum.

One of the most potent agencies for the spread of the Nature-Study idea throughout the country was the Ontario Agricultural College. For more than 30 years it has stood for a careful study of Nature and Nature's processes as an essential factor in successful agriculture, and it has strenuously insisted that such a study is one of the very best foundations for general culture. The

course of study there not only developed the intelligence, stimulated the imagination, widened the outlook, and gave the students scientific, practical and sympathetic interest in the world about them, but it also made them, as free citizens of a rising nation, take greater interest in civic affairs, and showed them the value of co-operation and collective action.

The Macdonald Institute at the Ontario Agricultural College, which stands for Nature-Study, Manual Training, and Domestic Science, as an integral part of the education of every child, should claim much credit for the evangelistic work it has accomplished during the past four years under the leadership of Muldrew and McCready. Its class-rooms have been thronged summer and winter by teachers from all parts of Canada anxious to learn more about the things of nature, so that they might better direct the children how to study the simple commonplace things that lie at their door.

Directly also, the College, by means of bulletins on many topics of general interest, set the people reading and thinking about the wonderful secrets of nature and the importance of a knowledge of these secrets; so that when the Nature-Study Movement was started the people were responsive. Indirectly, the Farmers' Institutes, which were really an extension system of the Agricultural College, did much to interest the farmer in improved methods of dealing with the soil, plants and animals, injurious insects and noxious weeds. By means of the Institutes scientific knowledge was popularized and applied to practical agriculture.

Nature-Study has no better champions and advocates than the staff of the Central Experimental Farm, Ottawa. Dr. James Fletcher has done as much probably as any man in Canada to further the movement. His public addresses and articles are most admirable and always carry conviction.

In some counties the Inspectors of Public Schools encouraged the teachers under their charge to undertake nature work, and brought the matter to the attention of the School Boards of their inspectorate. By appeals and helpful suggestions to teachers the Nature-Study Movement got a start before it was officially recognised by the Education Departments.

In some of the provinces the Superintendents of Education were men of scientific attainments, who saw the importance of the study of nature as a means of maintaining and developing that sympathetic attitude towards nature that characterizes the child before he attends school, of fostering the habit of close observation, and of creating that scientific spirit of enquiry in the effort to get at the truth. The influence of such men as Dr. MacKay in Nova Scotia, and Dr. Seath in Ontario, at the heads of the Departments of Education, did a great deal to pave the way for the new Movement in their respective provinces, at a time when their ideas were in advance of legislative opinion.

The last agency to which I shall refer, is the Macdonald Rural Schools Fund, supplied by Sir William C. Macdonald of Montreal, and administered by Dr. James W. Robertson, now of the Macdonald College, Ste. Anne de Bellevue, Quebec. The improvement of rural schools was the main object of this Fnnd. The means adopted were : (1) The building and maintenance of a large consolidated school in each of the four eastern provinces, as object lessons ; (2) The training of a certain number of teachers in Nature-Study, Manual Training, and Domestic Science for service in rural schools ; and (3) The maintenance of a group of school-gardens in each of the five eastern provinces, with a travelling instructor for each group, and all in perfect harmony with the education Departments of the provinces concerned.

The school-garden is now recognised as a most potent factor in the education of the young by begetting habits of close observation, thoughtfulness and carefulness. Properly used, the garden is "a means to an end, not the end itself,—the end being the symmetrical education of the child. The school-garden seeks education through utility and utility through education".

The teachers trained at the Macdonald Institute, Guelph, on their return to their schools have preached strenuously the doctrines of the new Movement.

Besides these direct results of the Macdonald Rural Schools Fund, the indirect results have been very marked. While many persons have been unable to see the Macdonald Consolidated Schools and school-gardens, there are very few persons who have not read about them and learned the object of their establishment. The object of the Fund has been achieved both directly and indirectly. The Consolidated Schools have performed most excellent service in showing better types of school buildings and in providing more efficient teachers and more effective teaching for rural life.

THE OTTAWA NATURALIST.

VOL. XX. OTTAWA, JANUARY, 1907. No. 10

PRESIDENT'S ADDRESS.

W. J. WILSON, Ph. B.

The Ottawa Field Naturalists Club was formed I take it to study the Geology and Natural History of Ottawa and vicinity. This seems on the face of it to be a praise-worthy object, yet we are constantly met with the question—What is the good of it all? Only a few days ago I was asked if I thought it was worth while for a busy man or woman to spend his or her time in working for the Club. I naturally answered the question in the affirmative, and in the five minutes at my disposal this evening I will give some of the reasons why I think it is worth while.

It seems to me that a good knowledge of the botany of the district is in itself a good thing and the same may be said of the insects, birds, fossils, rocks and every other subject which we study. Some of these studies are of considerable economic importance. We frequently see crops in fields largely reduced in value owing to the abundance of weeds, which if the owner understood he might either destroy or largely reduce. It is a case where ignorance is not bliss The study of the life history of insects has enabled our entomologists to point out the best and most effective way of destroying those that are injurious to plant life, and in this way have saved large sums to our farmers, gardeners and fruit growers. It is very useful to the contractor to know the quality of the rocks in his immediate neighborhood and where he can get the best material to use in the construction of buildings, etc. Now the detailed work that our members have an opportunity of doing year after year enables them to study these and kindred questions to the best advantage, and the Club has

unquestionably added materially to the sum total of our knowledge of local natural history and geology. I do not, however, wish to emphasize the material advantage particularly, as I think we are too apt to view everything in the light of dollars and cents. I believe our chief claim for the support and sympathy of the people of Ottawa rests on the much higher plain of educational work. While collecting information in regard to natural history and geology we keep in view the developing of a love of Nature Study especially among the younger members. It is not the purpose of the Club to make profound scientists of its members, but rather to lead them to observe and take an intelligent interest in the common things about them, thus giving an additional interest to every ramble through field and forest.

The name of the Club suggests its greatest usefulness, that is the field work. We are FIELD-Naturalists and our out-door excursions afford us the opportunity of doing our best work. This part of our work has often been referred to, but it cannot be too frequently reiterated. It is now generally recognized by colleges and educational institutions that the study of Nature from text books alone is useless, and many of them have gone to great expense to fit out laboratories in which the most practical instruction is given by bringing the student and the thing he studies directly together. This is what we do in our field-excursions. Those who join these excursions have an opportunity of studying the objects as they occur in nature and are led by suggestion rather than direct statement to find out all they can about them. The pleasure derived from the study of natural history objects is real and lasting. For instance, the sight of a plant will recall the first time you found it, and the time when book in hand you sat down and studied it till you found out its name, and all you could learn about it. Every season as you see it again it is like meeting an old friend.

Another important benefit the Club offers its members is the stimulus afforded by associating with those engaged in similar work. It requires a great supply of energy, enthusiasm and love for a study to keep on plodding along year after year. We have all seen students start out in the most commendable way and do good work for a short time; then the novelty having worn off

they began to tire of it, and soon if left to themselves drop it altogether. The Club in its special meetings of branches, soirees and excursions supplies the very thing that is needed in such a case and keeps up the interest till the work becomes a habit hard to break away from. I am quite sure with many members such a habit has been formed and it would be a difficult matter to keep them from following their favourite studies. These are some of the reasons why I think we are amply repaid for any work we do for the Club. People have of course the right to criticize our actions and ask such questions as I referred to at the beginning, and these criticisms and questions are no doubt productive of good.

If time permitted I would like to enlarge on some of the work that might be profitably taken up by the Club, but I will only say that no one need think that all the information possible has been gleaned in any one subject. Those best acquainted with the district will tell you that the opportunity of finding an abundance of new material at least in some branches, is almost as good as ever, and an exhaustive study of these offers a splendid field for our younger members.

In conclusion I wish to acknowledge the Club's indebtedness to the citizens of Ottawa for the generous support they have at all times given it.

A new edition of Prof. John Macoun's Catalogue of Canadian Birds is now being got ready for the press by the author. This edition will be published in one volume instead of in three parts as before, and the author will incorporate in the new edition any notes on extension of range, breeding habits, etc., that may be sent him.

DESCRIPTION OF *EUPITHECIA FLETCHERATA*, A GEOMETRID MOTH FROM OTTAWA, NEW TO SCIENCE.

By GEO. W. TAYLOR, Wellington, B.C.

This moth is one of many interesting Geometridæ that have been sent to me by Mr. C. H. Young, and I propose to describe it as a new species in the NATURALIST in order that the attention of the Ottawa entomologists may be directed to it, and that the record of Mr. Young's success as a collector of rare species of Geometridæ may stimulate others to activity in this somewhat neglected field. The Ottawa list in this family is growing apace by reason of Mr Young's industry, and every box he sends me contains some surprise in the shape of species that have not before been taken in the district.

EUPITHECIA FLETCHERATA, n. sp.

This is one of the broad-winged, medium-sized species of *Eupithecia*, in wing shape much like *Eupithecia latipennis* Hulst (which is quite common in Ottawa in the month of June), but is a trifle smaller. Expanse, 21 mm.

Palpi of moderate length, rather bushy, very dark (nearly black), with the extreme tips white. Front dark grey, with a fine black transverse line in front of the base of the antennæ.

Thorax grey, darker in front; a small white posterior tuft. Abdomen dark smoky grey; last segment darker, but in the male with a tuft of snow-white hairs seen only when the last segment is exserted; dorsal tufts black; a black lateral line.

Beneath, the pectus is white; the abdomen pale except the last segment which is dark grey; the legs are pale, except the tibiæ and tarsi of the 1st pair, which are dark with pale rings. Fore wings rather dark grey, with blackish cross lines enlarged on the costal margin.

The basal and intradiscal lines, with at least two intervening lines, are parallel to each other; they leave the costa at a sharp angle, turning at right angles when they reach the cell and running in an almost straight line to the inner margin; they are all farther from the base at the inner margin than at the costa.

The median line, which is double, takes much the same direction, including in its angle the distinct, oval, black, discal spot, and continuing in a wavy line to the inner margin.

The extra discal line appears as a large black blotch on the costa; it then runs in a regular outward curve to vein 3, then parallel to the median line to the inner margin; this line is emphasized by a series of eight black dashes on the veins.

Between the extra-discal and the submarginal lines are three dark lines, showing only as spots on the costa.

The submarginal line is faint, white, showing most plainly in a white dot between veins 3 and 4, and another between 1 and 2. Marginal line faint, black, broken at the veins. Fringe, basal half darker; dusky spots at the ends of the veins.

Hind-wings dark grey; the lines indistinct, but apparently all the lines of the fore wings are continuous, the most evident being the extra-discal and the submarginal; the first-named consists of black dashes on the veins (as on the fore wing) and so appears broader than the other lines.

Discal dot black, distinct. Fringe as on the fore wings. Beneath, fore wings bright grey. Costa with black marks showing the commencements of basal, median and extra-discal lines, and with another dark blotch in advance of the faint white submarginal line.

The extra-discal line and a dark shade beyond it are traceable across the wing to the inner margin, but the other lines can only be followed for a very short distance from the costa.

Marginal line distinct; base of fringe pale, otherwise as above.

Hind wings pale with 3 intra-discal lines marked on the costa and again on the inner margin.

There are also 2 extra-discal lines composed of distinct dots on the veins.

The outermost of these is parallel to the outer margin; the other runs in a straight line from the inner margin, in the direction of the discal dot, to vein 3, then in a regular curve to the costa. These two lines are therefore not parallel, being rather close together on the costa and farthest apart on vein 3. This is a peculiarity that I have not noticed in any other eastern *Eupithecia*.

Three or four dots on the veins indicate another line between the two just mentioned.

Discal dots distinct on all wings.

Described from two specimens collected by Mr. C. H. Young and labelled respectively Ottawa 3. viii. 06 and 10. ix. 06, and named in honor of Dr. James Fletcher, of Ottawa.

One of these specimens is in my cabinet, thanks to the generosity of Mr. Young, the other is retained in his own collection.

ENTOMOLOGICAL BRANCH.

The first winter meeting (1906-07) of the Entomological Branch was held at Dr. Fletcher's house at the Experimental Farm, on the evening of the 7th November; six present.

The Chairman suggested that the same plan of managing the meetings as had been followed in previous seasons should again be adopted this year, viz: asking each member present to speak for a short time, either upon specimens brought for exhibition or upon work done during the past season.

Mr. Arthur Gibson exhibited the cases of Tiger Moths of the genus *Apantesis* in the Experimental Farm collection, drawing attention to the rarer species and giving notes on the life-histories of many which he had reared from the egg. Twenty-six different species and varieties from all parts of Canada were included in this collection.

Mr. Andrew Halkett showed specimens of *Aleyrodes vaporariorum* an insect allied to the plant lice but with the appearance of very minute moths. This insect has been exceptionally abundant and destructive to garden plants during the past season Dr. Fletcher stated that it had been sent in from many parts of Canada and had been particularly troublesome in gardens where bedding plants which had been propagated in greenhouses were used. Specimens had been received from Edmonton, Port Arthur and many places in Ontario, and also from Montreal.

Mr. J. W. Baldwin showed a box of noctuid moths which were selected from a collection he had made at sugar on two nights at Graham's Bay, Britannia. Among the most interesting were a

nice variety of *Paragrotis ochrogaster*, *Xylina signosa*, *Hadena modica* and a very handsome specimen of *Bomolocha baltimoralis*.

Mr. W. H. Harrington spoke of some insects observed during the season. He had noticed specimens of *Hemdes hypophleas* flying at Meach Lake in the last week in October. He also described and enquired if any other members had noticed a large pocket gall on the upper side of the leaves of the American Hornbeam. No one present had seen this gall.

Mr. C. H. Young reported that he had also noticed a late occurrence of the small Copper referred to by Mr. Harrington and that he had also found the larvæ of *Feniseca tarquinius* and of a Syrphus fly feeding on the Woolly Aphis of the Alder on Oct. 3rd last.

Dr. Fletcher showed some insects from the Holy Land and again referred to late occurrences of insects. He had a brood of the larvæ of *Euvanessa antiopa*, which he had collected in the Arboretum of the Experimental Farm on the 27th Oct. The larvæ were on a willow tree most of the leaves of which had been frozen, and they were themselves much numbed by the cold at the time they were collected, the thermometer being almost at freezing point, and there had been several sharp frosts some nights before. Specimens were also shown of the Asparagus Beetle reared from larvæ collected this year for the first time at Ottawa. Several were found late in the season at the Experimental Farm, the beetles emerging Oct 30.

Mr. Halkett spoke of seeing the Tiger Swallow-tail in enormous numbers up the St. Agathe line of the C. P. R. early in June. He also spoke of the remarkable abundance of *Rheumaptera hastata* during the past season, and also of *Pteromalus puparum*, the parasite of the White Cabbage Butterfly, in pupæ found at Picton, Ont. These occurrences were discussed fully by those present.

Dr. Fletcher showed three fine cases of Plusias belonging to the Entomological Division and drew attention to those of rarest occurrence. He also exhibited Dr. Folsom's "Entomology" and spoke of it in flattering terms. The value of Dr. Smith's "Glossary of Entomological Terms" was also pointed out.

J. F.

Meeting held at Mr. Gibson's on 20th November, eight members present, including Mr. T. N. Willing, of Regina, Naturalist to the Province of Saskatchewan.

The minutes of the previous meeting were read.

Mr. Halkett showed a specimen of *Dytiscus harrisii*, female, which he had kept alive for some time in an aquarium.

Mr. Harrington exhibited a collection of the most striking local species of Dytiscus as well as some rare species of Coleoptera from Vancouver Island, including *Calopus aspersus*, *Chariessa elegans*, *Buprestis adjecta* and *Ischalia vancouverensis*.

Mr. Young showed a beautiful collection of micro-lepidoptera of over 2,000 specimens, nearly 200 of which had already been named by Mr. Kearfott, and which included several species new to science. The remarkable neatness and skill shown in mounting were much admired by all present.

Mr. T. N. Willing spoke of the work which is being done in natural history in the North-west Territorities and of his efforts to establish at Regina reference collections. Considerable progress had already been made and he hoped that in the near future much more would be done than had been possible in the past. Mr. Willing showed several boxes of insects which he had taken in the West. Insects injurious to crops were not as yet very noticeable in the West, but with the increase of mixed farming and with more land under cultivation these would doubtless appear.

Mr. Baldwin showed a neat cabinet case which he had made himself, including the compressed cork. This was well filled with a fine series of Catocalas, and other moths taken at sugar at Graham's Bay, Britannia. The specimens were in perfect condition, and no less than 34 good specimens were taken covering six species of Catocala.

Mr. Metcalfe told of his experience in using the floating water net for aquatic insects, which had been very unsatisfactory,

Dr. Fletcher showed a sample of flour badly infested by the beetles and larvæ of *Ptinus fur*. This is an occasional pest only of cereal foods but had been sent in three times this autumn. He spoke of the destruction of the seeds of the Silver Maple by a small Nitidulid, *Epuræa rufa*, which had been very abundant at

Ottawa last spring, every seed containing over a dozen of the larvæ. A fine melanic Bombus from the West was shown, but the species could not be recognized. Specimens of *Galeruca externa*, collected by Mr. Norman Criddle at Aweme, Man., were also shown.

Mr. Gibson showed an inflate of the larva of *Ecpantheria deflorata* which had been found feeding on violets at Niagara Glen, Ont., by Mr. J. B Williams, of Toronto, and also exhibited samples of currants and walnuts infested by the larvæ of *Plodia interpunctella*.

A. G.

INFUSORIAL EARTH NEAR LAKE WINDEMERE, B.C.

At a meeting of the Natural History Society of British Columbia held at Victoria, on the 19th November, Mr. Anderson exhibited specimens of infusorial earth taken from beneath the surface soil of a dried-up lake about three miles west of Lake Windemere. Prof. Shutt and he were asked last September, whilst travelling through the Upper Columbia Valley, to visit the place which is owned by a Mr. Ellis and partner. On reaching the place, it was found to be in a long valley the lower end of which was shut off by a natural dyke some twenty feet in height, and from forty to fifty feet wide at its base. The extinct lake was immediately above the dyke, fifteen to twenty acres in extent, the valley containing some six hundred acres, they were told. The lake site from all appearances, had been comparatively recently covered with water, as the surface was thickly covered with water plants resembling moss, probably a species of *Myriophyllum*, in a semi-dried state. Ploughing had been attempted, but owing to the nature of the plants alluded to, it was found impossible to do so; discing was then tried, but with equally poor success. On account of the damp state of the vegetation, burning was also found to be impracticable. Mr. Ellis expressed the belief that only way to get rid of the trouble was to rake it all up and stack it. Interspersed amongst the vegetation, and covering the ground,

and to a depth of at least six feet, were fresh water shells innumerable, of all sizes, such as are to be seen in the specimens exhibited. Mr. Ellis had dug down for about six feet, but realizing that there was a danger of striking a subterranean water course which might rise and inundate the land, he desisted Flowing into the valley and past Mr Ellis' house, is a small stream which loses itself lower down, but reappears some distance below the natural dam alluded to. The land below the dam is considerably lower than it is on the upper side, giving a good opportunity for drainage, so Mr. Ellis and his partner are running a tunnel through the dyke in order to ensure safety against possible flooding ; a very wise precaution Crops of different kinds had been attempted on parts of the land ; some parts gave good results whilst others showed acidity There was a rank growth of weeds belonging to the *Cenopodium* family, growing on portions of the site of the lake. Oats in places grew rank but the straw showed lack of phosphoric acid and potash and were in patches quite stunted. It was reported that within the memory of some of the inhabitants in the vicinity the lake site had been covered with water but of that no definite information was obtainable.

Among the most recent additions to the library of the Geological Survey is the "Nature Library" in ten volumes. This great work published by Doubleday, Page & Co., covers the whole natural history field, and though perhaps to be classed among "popular" rather than "scientific" books, every volume has been written and edited by a specialist.

NATURE STUDY, No. XL.

MANUAL TRAINING—THE MECHANICAL HOBBY.

By MARK G. MCELHINNEY, L.D.S., D.D.S., Ottawa.

What appears to be a reasonable definition of the word Hobby is, a pursuit followed for its own sake, a result of certain mental activities requiring expansion. Upon the ordinary pursuit become a hobby, there falls the spirit of art—work for the work's sake and the reward to the soul of the worker. To hobbies may be traced many great inventions and not a few of our most useful institutions. The very use of the term as indicating an enthusiastic devotion to one subject instead of a perfunctory performance of daily duty is a keynote to the whole subject. It is only when a pursuit becomes a hobby that it develops beyond the level of mediocrity. There is nothing to prevent one's hobby and one's vocation from being identical, or to their running on parallel lines. Happy is he whose vocation and hobby are inter-relative, because knowledge gained in one may be applied to the betterment of the other. Every successful man has his hobby; the individual that cannot become enthusiastic on some one subject in life is never likely to rise above the average in anything. Even the enthusiasm apparently wasted in a thoroughly unpractical hobby is not really lost, for the data accumulated in its cause may become available for many purposes. The introduction of Manual Training to our educational system is a happy indication that we are awaking to the fact that our methods in the past have been one sided. The old methods overlooked one of the most important of faculties, that which contains the incentive to *do* things. It is good to know things—it is better to be able to do things. While to know may produce a useless pedant—to be able to do develops a thinking and self-reliant character.

Under our methods of education, manual labour has fallen somewhat into disrepute. There has been too great a rush into professional and commercial life, because, to put it plainly, the trades are not considered so respectable, and the greatest ambi-

tion of the mediocre intellect is to be thought respectable—at any cost.

Why it should be thought more honourable to draw a plan for laying bricks than to lay them ; why the carpenter and the machinist should be considered less honorable than the physician and the lawyer, is hard to understand, except as an effect of false education.

In 1880 William Morris, the best pupil of John Ruskin, and himself an Oxford man, said : " We no longer believe in a class that is called, or set apart. Every man has a divine call to make himself useful to his fellows and the hallucination that some are called to do nothing but give advice, will soon fade away. Industrial education is both moral and spiritual. The man who fails to use his body every day in a certain amount of manual labor is a menace to the State and a danger to his inmost self. Safety lies in a just balance between head and hand."

To show how hopeful is our cause, tokening as it does that reform will come from within, I quote President Eliot, who recently said in a speech before the Independent Club of Buffalo : " I shall never be satisfied until one half the curriculum at Harvard is devoted to doing things instead of talking about them."

The introduction of manual training into our schools will do much toward the restoration of the dignity of labour. It is not the duty to be performed that should measure the standing of an occupation but rather the manner in which the duty is performed. Here is where the ethical value of a mechanical hobby applies. It has accomplished for individuals here and there what manual training endeavors to do for the numbers. It stimulates the individual to attain excellence for its own sake and such an effort cannot fail to be reflected in his regular vocation.

The growth of the Mechanical Hobby during the past 20 years has been rapid and widespread, as is well illustrated by the fact that formerly tools and materials for amateurs were few and expensive, while to-day dealers in such supplies are numerous and make special efforts to cater to the requirements of the amateur To-day everything the amateur requires can be obtained quickly and cheaply in any city.

Professional men and men in sedentary occupations are the principal buyers, and the result must be that there shall be a drawing together of the various classes and the formation of a bond of sympathy between them which cannot fail to benefit both.

The handicraftsman shall reap a value in respect and consideration and progress made in the direction of that goal toward which Tolstoi looks so earnestly. However little I may regard Tolstoi the mystic, I have a large respect for Tolstoi the humanitarian.

It has been said that the Mechanical Hobby trains the faculty of observation aad stimulates the desire for knowledge, and I am convinced that the reason for the poor work turned out by the average artizan is not so much low wages and the desire for cheap goods on the part of the public as it is to carelessness on the part of the workman.

The workman who studies carefully the requirements and observes closely the best examples of work done in his own line cannot fail to improve as a workman and will succeed proportionately.

The workman who can and does turn out the best that is in him can always find those who are willing and able to pay for his product.

The Mechanical Hobby is a quiet but powerful spirit working out the salvation of character and opposed strongly to the prevailing commercialism which is madly given to measuring all things, even men, by the sordid standard of dollars and cents.

In hundreds of factories, thousands of workmen turn out tens of thousands of chairs daily.

Down in his cellar or up in his garret or out in his woodshed the Amateur Mechanic will make an oak chair in six months, working at odd moments, putting his time, his labour, his thought, his individual self into that chair.

He knows each piece of wood, each joint, each screw—yes each scratch that refused so stubbornly to be rubbed out.

What are the tens of thousands of factory-made chairs alongside of this one?

It may be inferior, it may be wholly execrable—it matters not. The valuable element lies in the spirit in which the work was done.

The workman is bettered by the effort—his ultimate product may be a masterpiece.

This is the true inwardness of the Constructive Hobby.

Carpentry is one of the primitive arts and although the earliest implements that have come down to us are of stone and bronze, I believe that their survival is due to the permanent nature of their material and that wooden implements were made in times long preceding those of stone and bronze.

The first primeval savage who made anything, probably fashioned a war-club.

He looked at the product with pride, repeated that formula still so dear to the amateur "I made that myself", and immediately the real ascent of man began.

The next time that savage looked about him, things took on a new aspect and the design argument was born.

Of course the reasoning of this primeval man was founded upon a fallacy—he had created nothing, simply changed the form and the making of the club was as natural a part of the evolution of man as the putting forth of a bud is of the growth of a tree but he was some thousands of years in finding that out. What we are thankful for is that he did something and endeavored to find a reason and was no longer a beast on all-fours.

Carlyle defines man as the "tool-using animal." The great phrase maker discovered a greater truth.

The history of the use of tools is the history of the material progress of the race, and only under conditions of satisfactory material progress can the intellectual and ethical developments reach their highest attainments.

Carpentry is an art which has reached a most useful and beautiful development.

The tools required are comparatively few and inexpensive, and as a Hobby it well repays its votaries.

Dependent upon the skill and taste of the craftsman it can show a great variety of useful and ornamental products ranging from a pine wood box to a mahogany piano case.

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A SWARM OF BUTTERFLIES.

By GEORGE H. BRADSHAW, Morden, Man.

About the twentieth of August of this year the writer, in common with many others in this district, had the opportunity of seeing a rather unusual and certainly an interesting sight. Whether interested in such matters or not, one could not help noticing one day countless numbers of a large fiery-rust-colored butterfly—

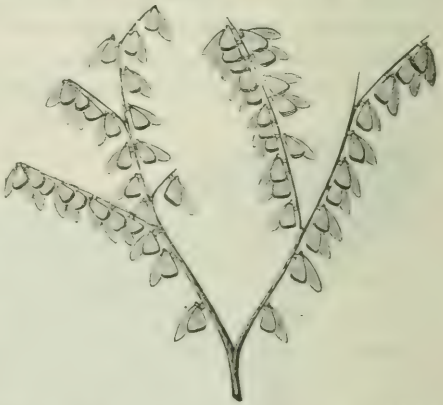
which I have since learned from Dr. Fletcher was the Milkweed Butterfly, *Anosia plexippus*—that came over-night, or at least seemed to come over-night, for there they were one bright morning hanging on the trees and shrubs, in such numbers and so closely together, that the trees on which they had settled were simply a blaze of red.

Apparently they liked the early morning sun, for they were

gathered on the sunny side of the trees and basked in the warmth of the sun till between eight and nine o'clock, when they suddenly determined to set about their day's work, or whatever they were in quest of, for they began to flit about in all directions and in such numbers that the air seemed full of them. During the afternoon they did not appear so plentiful.

I cannot recall the exact date when they first made their appearance in such large numbers, but it must have been about August 20th, and they remained for probably ten days. To give a better idea of the great number in this swarm, I may say that they appeared in equally large numbers over a distance of twelve miles, to my knowledge, and how much more I cannot say.

They seemed to settle down whenever night overtook them, if in an open field among the grass or grain, and if in a bush they gathered as close together as they could get on tree or shrub. They seemed, I think, to prefer the elm trees to any others, for there appeared to to be far more on them than on any other kinds.



There had been odd individuals of these butterflies flying about as early as a month before the coming of the main body and odd ones remained behind for probably a month longer; but the great swarm came suddenly one day and disappeared with equal suddenness. They seemed a sleek and well conditioned host and looked as though they fared well, but what they lived on I cannot say.

During the early morning one could go out and gather them in any quantity, but as soon as they were on the wing they would ead one a merry chase.

The weather during the time of the swarm was fine, bright and warm, with southerly and westerly winds prevailing.

The district they visited was along the base of the Pembina range of hills.

The above interesting note by Mr. Bradshaw refers to a well known habit of the Milkweed Butterfly (also known as the Monarch). This habit of collecting in large numbers resembles very much the similar habit among birds, when gathering together in large numbers just before migrating. The Milkweed Butterfly is one of the few insects which migrate in large flocks. It is almost certain that none of the insects in these great swarms pass the winter in Canada. Although exceedingly common in many years, all the parents of the vast numbers sometimes seen sailing over clover fields or gathering nectar from various flowers, in late summer and autumn, fly up into Canada from the south. The caterpillars are very restricted in their food plant and are not known to feed upon anything except the various species of Asclepias or milkweed. The excellent figure given above of the butterfly and the smaller woodcut representing part of a swarm at rest on a dead branch, have been kindly lent by the Editor of the Canadian Entomologist, and were used in an article by Mr. J. Alston Moffat in the Annual Report of the Entomological Society of Ontario for 1899, where an occurrence of these handsome butterflies similar to the one now recorded from Manitoba, which was observed near London, Ont., is described.—J. Fletcher.

The Fulvous Tree-Duck in British Columbia.

In the *Canadian Naturalist and Geologist*, Vol. VI, 1861, p. 334, there is what must stand as a good record of the fulvous tree-duck in British Columbia. In an article entitled "Recollections of the Swans and Geese of Hudson Bay" Mr. George Barnston says: "Two small species of southwest habitat, the *Dendrocygna autumnalis* and *D. fulva* never come north, as far as I know. I have never seen the first, but have shot one out of a pair of the latter on the banks of the Columbia above Okanagan. This I daresay is usually its limit to the north, and I believe it has never been seen to the eastward of the great stony ridge. Neither of these elegant little geese ever visit Hudson Bay." This record is of additional interest in view of the recent occurence of this species in British Columbia as given in the December number of this journal.

Toronto, Ont. James H. Fleming.

NOTES ON THE SKELETON OF A WHITE WHALE OR BELUGA, RECENTLY DISCOVERED IN PLEISTOCENE DEPOSITS AT PAKENHAM, ONTARIO.

By J. F. WHITEAVES.

In August, 1849, portions of the skeleton of a small cetacean were discovered in stratified clay of pleistocene age "on the line of the Rutland & Burlington Railroad in the Township of Charlotte" (Vermont) "about twelve miles south of Burlington, and a little more than one mile eastward of Lake Champlain." These remains were described and figured by the late Professor Zadock Thompson, in the American Journal of Science and Arts for March, 1850, under the provisional name *Delphinus Vermontanus*, which he changed to *Beluga Vermontana*, in 1853, in an Appendix to the "History of Vermont." But it is now quite clear that they belong to the genus *Delphinapterus*, Lacepede, of which *Beluga*, Rafinesque, is a synonym.

More or less complete skeletons of this small whale have since been found in marine deposits of pleistocene age, at Montreal in 1858; at Riviere du Loup (en bas) in 1864 or 1865 (detached bones only); at Cornwall, Ont., in 1870; and on the Jacquet River, N. B., in 1874. By far the most perfect of these is the fine specimen from Cornwall in the museum of the Geological Survey of Canada. It is a nearly perfect skeleton of an adult individual, which, as now mounted, is a little more than twelve feet in length, though a few of the vertebræ are missing. These Canadian specimens, and especially the Cornwall one, have led to the conclusion that Thompson's *Beluga Vermontana* is probably identical, both specifically and generically, with the common White Whale or Beluga (*Delphinapterus leucas*) now so abundant, in a living state, in the lower St. Lawrence and North Atlantic. In his latest list of the fossils of the pleistocene of eastern Canada (Canadian Ice Age, 1893, p. 268) Sir J. W. Dawson says: "there seems no good reason to believe that the *B. Vermontana* of Thompson, from the pleistocene of Vermont, is distinct from *B catodon*," Gray, which, it may be added, is another well known synonym of

D. leucas. Beddard, in his "Book of Whales," published in 1900, says that "both Sir W. Flower and Mr. True concur in allowing but one species of White Whale" (*D. leucas*), and it certainly seems most likely that the names *Delphinus Vermontanus* and *Beluga Vermontana* will have to be added to its already rather lengthy synonymy.

On the 5th of September, 1906, a skeleton, which is obviously that of a very young individual of this same White Whale or Beluga, was found by Mr. Patrick Cannon, while digging a well on his farm, on lot 21 of the 11th concession of Pakenham, Lanark Co., Ont. The Rev. J. R. H. Warren, of the village of Pakenham, informs the writer that this skeleton was embedded in blue clay, fourteen feet below the surface, and that only a portion of it was dug out. In digging the well, he adds, some depth of blue clay was first bored through, then a mixture of clay and shells, in which the skeleton was found, was struck, and the excavation ended in more blue clay. The well has since been incased or lined with stone, and now contains a considerable depth of water, so that it may be somewhat difficult to dig out the remainder of the skeleton.

The bones that have been exhumed so far, from this excavation, with samples of the mixture of clay and shells in which they were found, have been kindly lent to the writer by Mr. Cannon. The former consist of a nearly perfect skull (with only a few of the teeth missing) and one of the tympanic bones, with most of the cervical vertebræ and three of the dorsals with some of their epiphyses. Or, as interpreted more definitely by Mr. L. M. Lambe, of the skull, the left tympanic, the atlas, axis, third, fourth and fifth cervical vertebræ, and the second, third and fourth dorsal, with some of their epiphyses.

Apart from their obvious immaturity, this Pakenham skull, and the vertebræ immediately adjoining thereto, seem to be essentially similar to the corresponding parts of the skeleton of the Beluga from the Cornwall pleistocene, and of that of a recent specimen of the White Whale, from Metis, in the Museum of the Survey.

The discovery of this skeleton at Pakenham is of special

nterest, as no remains of Cetacea of the genus *Delphinapterus* had previously been found in the pleistocene deposits of the Ottawa valley.

Samples of the clay, with shells, in which this skeleton was found, contain numerous specimens of *Macoma Balthica* (L.). This little tellinid is the *Venus fragilis* of O. Fabricius (1780); the *Psammobia fusca* of Say (1827), and *Sanguinolaria fusca* of Conrad (1831); and the *Telina Groenlandica* of Beck (1839). It is exi tremely abundant in the pleistocene sands and clays at many localities in the St. Lawrence and Ottawa valleys. It is also commcn, living, in very shallow, brackish or salt water in the estuary and Gulf of the St. Lawrence, and elsewhere on the Atlantic coast of Canada It is said to be the most abundant shell in the clay in which the original type of *Beluga Vermontana* was found in Vermont, the other species found with it being *Mya arenaria*, *Saxicava rugosa*, and *Mytilus edulis*.

Ottawa, Jan. 15th, 1907.

A friend of mine out hare-shooting on Jan. 28th, about fifteen miles from Montreal found a partridge with its feet and the end of its tail feathers frozen into the ice crust. It was under a thick hawthorn bush (a lot of dead leaves on the bush, but not a sign of a berry or any other food around), and though in a weak condition was able to flap its wings, in fact that was what drew my friend's attention to it. He had kicked at the bush and heard a noise but seeing no hare run out he looked under the leaves and found this bird, which he liberated. It ran a short distance and then flew away. All naturalists are familiar with the fact that partridge often dive into deep snow and sleep there but how often are they known to roost on the ground (or snow) as this bird was doing?

GEO. A. DUNLOP.

Montreal, Jan. 29th, 1907.

SOME NOTES ON WINTER BIRDS.

By C. W. G. EIFRIG.

By our Canadian winter birds are meant certain birds of several different families, which in their coming and going show marked inexplicable anomalies or eccentricities, so to speak. To them belong primarily birds like the pine grosbeak, the Bohemian waxwing, the evening grosbeak, and secondarily birds like the hawk, snowy and Richardson's owls, the Canada jay, and to some extent the redpoll, pine siskin, snowflake and goshawk. These birds are not real migrants, *i. e.*, birds that come and go to and from their breeding places at nearly the same time each season, and in the same general direction and to the same general destination, so that their winter habitat is well known; nor are these Canadian winter birds real permanent residents at their breeding localities. They indulge in, what seems to us to be more or less of an aimless wandering about the country, most of them not going much farther south than our southern boundary, if that far, at all. What induces them to wander over the country in this way, showing up here in numbers one winter and then not coming again for several seasons? Is it the low temperature prevailing in their northern habitat? No, because other seasons, severer than the present one here, they remain in their higher latitudes. That also does away with the idea that some people have, that these birds have a certain premonition of an impending serious winter, a certain vague premonitory-barometric sense, allowing them to diagnose the weather in advance, and escape coming hard-ships! Is it on account of a failure in their food supply? Although this is undoubtedly a better reason than the first, it does not explain all. They indulge in such wanderings when their food supply is not short in their homes to the north. When the Canada jay came here two winters ago, and went in great numbers as far south as Toronto—a thing that had not occurred for about fifty years—their usual food supply, the kitchens of the lumber camps, the offal from the farm-houses, were there as usual. Neither can it be assumed that when the snowy owls make their phenomenal periodical incursions into southern territory in such vast numbers, that

their usual food supply, *i. e.*, small mammals and birds, have in those seasons been swept off the face of the earth or at least of their habitat—so, what is the reason for their wandering? No one seems to know. Ernest Thompson Seton in one of his books says that the little chickadees on certain days in the year get "crazy" spells, during which they act very queer, as though they had lost their "birdsense." And the same has been observed of other birds, *e. g.*, the capercailzie and the blackcock in Germany, etc. Perhaps some of this queer, eccentric feeling on the part of these birds is responsible for some of their wanderings too!

Neither does the appearance of some of these birds at Ottawa this winter make the matter any clearer. A hawk owl (*Surnia ulula caparoch*) which breeds in Newfoundland, Labrador and the Hudson Bay country, was shot here on Oct. 9 last, and another seen at that time. Mr. Henry the taxidermist had two more. Usually they come later, if at all. At that time it was very mild here.

A very unusual migration of the American goshawk (*Accipiter atricapillus*) took place last October and beginning of November. While a few birds are seen here most winters, they are nearly always in the immature plumage, and rather rare at that, but at this time a regular migration of them took place, mostly composed of adult birds in the finest plumage. That is certainly remarkable. On Oct. 18 a fine large female was shot by a farmer near East Templeton in the act of carrying away a good-sized plymouth rock rooster. On Nov. 3, a boy shot a nice male near the rifle range, which had just put himself on the outside of a ruffed grouse (partridge.) Mr. E. G. White noticed a pair together near Pembroke, one also in the act of devouring a grouse. The taxidermist got several more from this vicinity, and all save one in the finest blue plumage. At Kingston this flight was still more noticeable. Mr. E. Beaupré of that city writes me, that he never saw so many goshawks together as this year, *i. e.*, fall of 1906. There were regular flights of them passing over the city. He saw them almost every day in October, but during the first week in November they were most abundant. He saw seven flying at one time. One he approached quite closely while tearing up a hairy woodpecker.

Another tried to make a meal of a wooden decoy duck. Many were brought to local taxidermists.

The pretty pine grosbeak (*Pinicola enucleator leucurus*) is repeating his performance of three winters ago and is paying us a visit in numbers. They put in an earlier appearance than usual. The first ones were seen Nov. 3rd near the rifle range and on Nov. 5th one was found dead on the Experimental Farm. At the same time and before, they were extremely abundant near Pembroke, and from then until now they have remained with us, right in the city. They frequent the many mountain ash trees upon which they gorge themselves on the berries. They do not, however, eat the pulp so much as the seed. The old males are of a gorgeous rose-red, the female and young are ashy gray, with greenish yellow on the crown and rump; the wings are crossed by a white bar. The females and young greatly predominate in numbers. They are, as a rule, very unsuspicious of man, and allow a very close approach, and this unsuspiciousness is often their undoing at the hands of boys, who should be restrained. On Jan. 21st, I noticed a flock of ten on a mountain ash tree near the corner of Bank and Queen sts. Some of these would fly down on the sidewalk and street to eat the fallen berries and would hardly move away for the passers-by. They should be protected, and, if necessary, fed to keep them here. Other articles of food of which they are fond are sumac berries and the buds and tips of twigs of evergreen trees. Broken nuts and suet will attract most birds to the house in winter.

The snowflake (*Plectrophenax nivalis*) also put in an early appearance. The first were seen Oct. 27th on Kettle Island. Great flocks of them were common for several weeks around the city, when they just as suddenly disappeared.

A single specimen of the beautiful Bohemian waxwing or chatterer (*Ampelis garrulus*) found its way into the city on Dec. 2. It took up its stand in a little mountain ash tree on Russell Avenue, right over the sidewalk, and if passers-by became too numerous would shift its headquarters to another tree of the same kind across the street. Here it remained, all alone, save the pesky sparrows, for six days. At first it would almost allow itself to be

touched, later on it became a little shyer. It would utter a soft musical twitter, much like the "beady" song of its congener, the cedarbird.

The snowy owl (*Nyctea nyctea*) seems again to have given Ottawa a wide berth, whereas further south many are reported. I have seen one only, which had been shot about Nov. 15th near Farrellton.

Of the rare great grey owl (*Scotiaptex cinereum*) another inhabitant of the fur countries of the far north, I have seen and heard of four so far this winter, all of which found their way into the hands of Henry the taxidermist.

At the same place I found a specimen of the rare Richardson's owl (*Cryptoglaux tengmalmi richardsoni*) which had been shot here on Nov. 16th.

The beautiful evening grosbeak (*Coccoth-thraustes vespertinus*) has not put in an appearance so far, much as his presence is desired. He is one of of the most irregular birds in his movements. He may come at any time in winter, beginning or end, and stay for a day or a month at a place, and then not be seen there again for years, or perhaps come for several years in succession.

Neither has the comical Canada jay (*Perisoreus canadensis*,) the clown amongst our northern birds, deigned us worlhy of his visit this winter. Instead he prefers to steal meat from the shanty-kitchens in our northern words. Redpolls (*Acanthis linaria*) and pine siskins (*Pinus spinus*) may be seen in favorable localities all winter. They come and go without pretense to any regularity.

Who can solve the riddle of the coming and going of these birds?

THIS YEAR'S AWARD OF THE LYELL MEDAL.

The many friends of Dr. J F. Whiteaves, palæontologist and zoologist to the Geological Survey of Canada and one of its assistant directors, will be pleased to learn that he has been awarded the "Lyell Medal" by the Geological Society of London. The presentation of this medal is made at a most appropriate time, as Dr. Whiteaves has just completed the fiftieth year of his scientific work.

Born at Oxford, England, in 1835 his first paper, entitled "On the Land and Fresh-water Mollusca inhabiting the neighbourhood of Oxford" appeared in 1857 in the Proceedings of the Ashmolean Society, and was followed by others, printed in a number of scientific journals, on palæontological and zoological subjects, whilst yet in England.

Dr. Whiteaves visited Canada for the first time in 1861; returning to this country in 1862 he resided in Montreal and in the following year was appointed recording secretary of the Natural History Society of Montreal and curater of its Museum, in which position he remained for twelve years, publishing during this interval valuable palæontological papers, as well as reports on the results of deep-sea dredging operations conducted by him in the Gulf of St. Lawrence.

In 1875 Dr. Whiteaves first became connected with the Geological Survey, and in the following year succeeded the late Mr. E. Billings as Palæontologist to the Survey. With the acceptance of this position Dr. Whiteaves had opened to him an enlarged field for work of which he has taken full advantage as his long list of papers and official reports published during the last thirty-two years fully testifies. His reports, both palæontological and zoological, have gained for him a world-wide reputation and have placed him in the front rank of eminent men of science whilst they have brought Canada more than ever forward in the scientific world. His writings are noted for their accuracy and for the succinct and terse language used in all descriptions. His recently issued Part IV of Volume III of "Palæozoic Fossils" reveals a descriptive power perhaps surpassing that of any of his previous publications, an augury it is hoped of many more years of industry and zealous work to be performed, work rendered increasingly valuable with the accumulation of data and a rich, ever widening experience.

Sir William Dawson and Professor Frank Adams the only other recipients of the "Lyell Medal" in this country. Professor John Morris was the first to receive it in 1870 and in the list of awards of later dates are the names of Dr. Joseph Leidy, Professor Henry A. Nicholson, Professor Rupert Jones, Dr. A.

Smith Woodward and more than a score of other distinguished geologists and palæontologists who have been similarly honoured.

We extend to Dr. Whiteaves our hearty and sincere congratulations on having received this well-merited recognition of the value of his scientific work from such a high source as the governing body of the Geological Society of London as a "mark of honorary distinction" under the consideration that he has "deserved well of the Science."

L. M. L.

SOIRÉES.

The openiing soirée of the Ottawa Field Naturalists' Club, held on the evening of December 6th in the Assembly Hall of the Normal School could hardly have been more successful. The attendance was large and the programme one of the best ever provided by the Club.

The president, Mr. W. J. Wilson, presented an able paper dealing with the aims of the Club, the nature and scope of its work, and the advantages afforded to its members. His address was printed in the last issue of the NATURALIST.

Dr. Jas. Fletcher read a paper prepared by Dr. J. Chester Bradley of the University of California on "An Entomological Excursion to the Selkirk Mountains." Illustrating the paper was an exceptionally fine set of lantern slides. The views differed from the ordinary photograph taken by tourists; for besides bringing out scenic effects such as the characteristic skyline of the Selkirks, their glaciers, waterfalls, rivers and lakes, they show in the foreground features of especial interest to the naturalist These included the characteristic plants of the different zones, from the lower valleys with their gigantic trees and dense undergrowth to the stunted firs of the tree limit and the alpine meadows of the higher slopes There were some particularly fine views of these meadows showing their great extent and the remarkable size and profusion of the flowers. Dr. Fletcher made the views doubly interesting by observations and incidents drawn from his own experience in the Selkirks.

Rev. C. G. Eifrig gave a practical demonstration about the study of birds, using colour as a means of identification suitable for beginners. Mr. Eifrig made use of mounted specimens, a field glass, and popular books on birds as a person might actually do in the field. He drew attention to the number of illustrated books which make the study of birds more interesting and much easier than it was some years ago, and referred to Ottawa as a city particularly favored by the birds. Among the books recommended by Rev. Mr. Eifrig were :

Bird Life, by Chapman ; Bird Neighbors, by Blanchan ; Birds of Ontario, by McIlwraith : Bird Guide, by Reed.

As is customary at the opening soirée there were exhibits of specimens illustrating the branches of natural history in which the Club's members are specially interested. A fine collection of living turtles, a young alligator and several batrachians exhibited by Mr. Andrew Halkett attracted much attention. Mr. Eifrig had brought from his private museum many sheets of beautifully prepared botanical specimens and birds ; Mr. W. T. Macoun exhibited specimens of plants and Messrs. Fletcher, Gibson, Young and Baldwin insects of great beauty and variety. Geology was represented by fossils and specimens of ore from Cobalt shown by Messrs. Ami and Collins A very fine series of colored plates of Canadian weeds and the seeds of these plants in bottles were exhibited by Mr. Miller and a collection of photographs of scenery on the Liévre by M. Lemieux.

SUB-EXCURSION TO THE BEAVER MEADOW, HULL, FEBRUARY 2ND, 1907.

It has not in the past been customary for the Ottawa Field Naturalists' Club to hold winter excursions, but this year it was thought best to give them a trial and the first one, which took place on Saturday, February 2nd, proved quite a success, although the number which attended was not large, doubtless owing to the threatening state of the weather, the day being very mild and promising rain. The party met at the toll-gate on the Aylmer Road at 3 o'clock, and the route taken was up the Beaver Meadow

and back through the woods. To a naturalist there are many things of interest to be found in the woods in winter, and many objects attracted the attention of the party. The leaves being off the trees in winter, the birds' nests are more easily found now than they are in the summer, and may be taken without compunction, although some young ladies who were passing made the remark that it was "a shame to rob the poor birds' nests," thinking, perhaps, as we are afraid too many do, that the birds use the same nest two years in succession. It is true that some birds do this, but very few of those which are seen about Ottawa. Nests of what were taken to be the least flycatcher, Maryland yellow throat, and one of the vireos were among those seen. A few chickadees were the only birds observed during the afternoon. The beauty and usefulness of the climbing bitter-sweet—*Celastrus scandens*—was impressed on the members of the club by the fine appearance of the scarlet berries which were seen in great abundance and still in good condition. This is one of the best climbers to plant about a house, as the foliage is seldom injured by insects during the summer, and is of an attractive shade of green and the highly colored fruit, which remains on the plants all winter, makes the home look quite cheerful. The red, white and black ash were all observed among many other trees, these three being easily distinguished by the color of the wood and the buds. An apple tree was found growing wild among the forest trees. Chance apple seedlings are not so common in this part of Ontario as they are a[illegible] fr[illegible]rther south and west.

The eggs of the tent caterpillar were found on the choke cherry, a favorite food of this insect. The finding of these eggs there and elsewhere this winter shows that the tent caterpillar is again on the increase.

After a very enjoyable outing, which was a welcome change to those who have to be in offices all week, the party reached Hull about 5.30 p.m. W. T. M.

NATURE STUDY, No. XLI.

Manual Training II. The Machinist's Art.

By Mark G. McElhinney, L.D.S., D.D.S., Ottawa.

Perhaps the most interesting of all trades or mechanical arts, as some prefer the term, is that of the machinist.

There is a fascination about the cutting and shaping of iron, steel and brass that is irresistible. The stubborn nature of the materials, the permanence of the product, the accuracy and effort called forth and above all the perfection and adaptability of the machines and tools required, all provide elements for the perpetual joy of the worker.

Take for example the modern turning lathe. It is the embodiment of concrete mathematics. It can add, subtract, multiply and divide with unalterable accuracy. It can duplicate angles to the smallest fraction of a degree and can turn work to less than the thousandth part of an inch. The turning lathe has been called the King of Tools. It is the great central figure of our mechanical development. Without it, that greatest of all human productions, that potent civilizer, that real missionary, the steam-engine, were impossible. The triumph of steam is the locomotive, which has solved more problems and brought more blessings than all the philosophies, all the inventions and perhaps all the religions of the preceding ages.

The steam-engine was the stimulus of the 19th century and the most potent physical factor of the Victorian era. Under its broadening influence art, science and literature blossomed and bore good fruit and man outgrew the narrow confines of tribe and nation, grasped his far off brother by the hand and promises in the near future to become a citizen of the world.

Let us now consider briefly how an amateur would set about the production of a steam-engine.

First there is to be chosen the type, which may be stationary, marine or locomotive, simple or compound, trunk, reciprocating or turbine. Next comes the general design, which shows the engine in its finished state with its description and dimensions. Then each separate part must have a drawing in detail, giving accurate measurements of each, with directions regarding material and fin-

ish, so that when the individual parts are finished they will fit accurately together and form one harmonious whole. When these drawings are completed, patterns must be made for the parts to be cast in iron or brass.

In making the patterns the amateur must have some knowledge of the moulder's trade in order to make the proper allowance for drawing the patterns out of the sand, for the contraction of the metals in cooling and for coring the hollow parts The shapes of hollow parts cannot be made in ordinary sand, which would not stand up ; but core boxes must be constructed in which are made the hard baked sand cores which are knocked out of the holes after the casting is done. The steel forgings are made directly from the drawings and do not as a rule call for patterns. To do this the amateur must be somewhat of a blacksmith.

After the castings and forgings, comes the machining of the parts, which falls to the lathe, sharper, or drill, as required. In addition to this there is a certain amount of bench work such as scraping, filing, tapping for screws and general fitting. It will be seen that in these manipulations the amateur has been in part a draughtsman, pattern-maker, moulder, blacksmith and machinist, and if he complete the engine and run it he will learn some of the duties of a fireman and an engineer. He will have acquired an increased respect for each of these arts and for the men who practice them well.

One of the chief benefits of the mechanical hobby to the individual is the training of the faculty of accuracy.

To work to definite measurements, to be able to perceive the relations of things in the material world, is just that kind of education which this age and in fact all preceding ages have lacked.

The perception of relations between things in the concrete is the only basis on which to train the mind to compare ideas in the abstract. The lack of this basis is responsible for much of the loose thinking of the present day.

If our truly heroic efforts in the line of education are to have any real results, we must begin upon a sound basis, and we may well rejoice at the adoption of manual training in our schools, for that is the very element best fitted to bring about the desired result.

I have often been struck, in many conversations with machinists and engineers of the better class, by their terse and pointed methods of reasoning. If upon such a basis there could be erected the superstructure of a liberal education, the results should be ideal. Manual training should furnish this basis and go beyond it by awakening the incentive towards the getting of further knowledge.

To awaken this incentive is the highest fruit of an educational system, for in the last analysis we find that each individual must educate himself and herself or forever remain a mere repository of useless knowledge.

The old methods of education were merely encyclopedic. The new method should make of each fact a living and working truth.

ARTISTIC AND SCIENTIFIC HOBBIES.

As an example of an artistic hobby, Amateur Photography stands out pre-eminently. It has many valid claims to our attention. It develops the artistic sense, trains the judgment, acquaints one with some of the laws of chemistry and optics and above all brings its votaries into close communion with the beauties of nature. It has an amusing side, I was almost going to say a pathetic side, as well. The considerations of light, time and position, as well as the often totally irresponsible action of developers and other items, keeps one continually interested and incidentally adds to one's knowledge in many directions.

It most certainly offers continual exercise in training one's patience and self control; but who will say, who has conquered the A,B,C, and obtained a few successes, that the result is not worth the trouble. Like all really valuable hobbies, it is difficult to attain proficiency therein, and there are ever widening and alluring fields opening up ahead.

My first camera, back about 1887, was a black box with a pin-hole through a piece of ferrotype plate stuck in the front. This did for a few weeks. Then I read up the article on Photography in an encyclopedia and made a sliding box camera with an old opera glass lens. Its productions in the architectural line were more wonderful than the leaning tower of Pisa.

Then a real lens costing about $3.50 was purchased and a more ambitious attempt was made—bellows, shutter and all.

In the three years following 1887 I made six cameras of varying efficiency. Then I bought a No. 5 folding Kodak for films but soon gave up films and took to plates again. At presen I use a 4 x 5 Premo. B., for plates, which serves my very ordinary attainments and requirements in this line very well. One contracts the habit of having a camera at hand, especially on the water or in camp, and does not feel fully equipped without it. It adds not a little to the pleasure of living to have these pictorial records, to say nothing of their value in substantiating our stories of what we catch and shoot.

Regarding scientific hobbies I shall be brief.

Previous to that time when governments recognized the true value of purely scientific work, nearly all investigation was carried on along the lines of the hobby.

Astronomy, microscopy, scientific farming, histology and many other lines of investigation were developed in the spare time of earnest men who either could afford the leisure or earned their bread by other means. It was long before the world learned that purely scientific research had any commercial value.

Even now, amongst the ignorant can be heard sneers at the men of theory and not a few farmers laugh at scientific farming—as a scythe might have one day laughed at a reaping machine.

To-day, however, things of this nature are getting on to a different plane—we have government astronomers, government histologists, geologists, botanists, entomologists, horticulturists, a fish commissioner and a host of others. In our Geological Survey and our Experimental Farms we have the spirit of the hobby made flesh ; and not only do we derive certain theoretical benefits from the same, but the advantages can be measured in those big round dollars which to so many people represent the standard of utility.

Were it possible to unscrew the skull cap of any of these men in the Geological Survey or on the Experimental Farms there would be found a live healthy hobby, a hobby in the real sense of work for work's sake :—an altruistic hobby, for they work early and late, and their contributions to the welfare of the nation are large, out of all proportion to the reward which they receive for their services.

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SOME CURIOUS FACTS ABOUT FISHES.

(Based on an address delivered before the "Unity Club.")

By ANDREW HALKETT.

The subject of this article is: certain strange facts concerning the habits and structure of fishes. A goodly sized volume might be devoted to this subject to do it justice; therefore a few singular facts only are given here, under distinctive headings.

FISHES THAT CAN LIVE FOR A PROLONGED TIME OUT OF WATER.

The November, 1901, issue of the OTTAWA NATURALIST contained a short article of mine, entitled: "An African Dipnoid Fish" treating of a group of fishes distinguished from all others by "the double character of the respiratory organisation: these remarkable fishes breathing not only under water by gills, but at times ... .. when the waters dry up, atmospheric air by rudimentary lungs"; and a succinct account of this dipnoid group is contained in that article.

But the lung-breathers are not the only kind of fishes which can live for a longer or shorter time out of water. There are others whose gills are provided with accessary organs for retaining water, so that those fishes are supplied with oxygen during their sojourn on land. A well-known instance of this is the Climbing Perch of India, a fish which leaves the water and walks by the aid of its spines over land. It even climbs trees; a fact alluded to by Herbert Spencer in his "Principles of Biology," and Daldorf in a memoir communicated long ago to the Linnean

Society mentions having taken a climbing perch in the act of ascending a palm-tree which grew near a pond. "The fish had reached a height of five feet above the water, and was going still higher."* Furthermore, Drs. Parker and Haswell in their "Text-Book of Zoology" state that the climbing perch "has become so thoroughly a land animal that it is drowned if immersed in water."

There are also certain gobies of the Indo-Pacific which move about over the ground at low tide in search of their food, and take rapid leaps to escape danger. It has been asserted of these also that they would drown if forced for an indefinite time to remain under water. One of those gobies I have myself seen resting on a moist object in its aquarium.

Whilst engaged in some Fisheries matters, at the Trent River, Ontario, a few years ago I had same fishes boxed up and expressed to Ottawa. On opening the box on my arrival I found some of the mud-pouts still alive and when replaced in water they were soon themselves again ; and whilst turning over moist stones along the shore at the west side of Vancouver Island I was surprised to find numerous little frisky, elongated, and compressed fishes which were there awaiting the return of the tide.

FISHES WITH BOTH EYES ON THE SAME SIDE OF THE HEAD.

There are instances of distortion in nature. I mean by this term not some individual freak, but a distortion brought about by a modification of structure permanently affecting a whole group of creatures. The flat-fishes, which are very compressed, are an instance of this. When the newly hatched halibut, or the plaice, or the flounder, has left the egg, it is essentially just like any other fish, with an eye on either side of the head. Very soon, however, the eye of one side, in certain kinds the right in others the left, moves around to meet its fellow, thus leaving one side of the fish eyeless and blind. The jaws also undergo distortion, and the eyeless side remains whitish like the under parts of other fishes, whilst the eyed side becomes covered with pigment coloring substance. The fish then lies on the blind side, which serves the same purpose as the under part of fishes in general.

*Dr. Günther : 'An Introduction to the Study of Fishes,' p. 516.

ELECTRIC FISHES.

There are three kinds of fishes, unrelated to each other, which possess electric functions: that is, they are capable of giving electric shocks. They are the Torpedoes, or Electric Rays; the Electric Eel; and the Sheath-fishes, or Electric Cat-fishes. There are others, the names of which need not be mentioned, which possess elementary or pseudo-electric organs. The electric muscular substance is differently adjusted in the three kinds enumerated. In the Torpedoes the batteries lie on either side of the head; in the Electric Eel they are longitudinal bodies in two pairs, immediately below the skin; and in the Sheath-fishes they extend all over the body, being thickest on the abdomen.

I had once an opportunity to test the powers to give electric shocks which two of these three kinds of fishes possess. Being invited by the keeper of the aquarium of the Zoological Gardens in London to receive a shock from an Electric Eel, I placed my hands upon the fish and received it, but it was slight, a circumstance probably due to the fact that the eel was not at home in its changed environment. Shortly afterwards Dr. Forbes, who kindly escorted me through the aquarium of the Liverpool Public Museum asked if I would like a shock from an electric cat-fish. I remembered the slight shock which the eel had given, and therefore readily placed my hands on the side of the fish, but the shock it gave was so violent that I would not again care to repeat the experiment.

FISHES WHICH TAKE CARE OF THEIR PROGENY.

The vast majority of fishes, of which there are some 13,000 known species, take no care whatsoever of their progeny. The eggs are deposited, and then immediately fecundated, and the parents never see their young, unless they should afterwards encounter them, as they might other fishes, and perhaps devour them. A comparatively few, however, do take care of their young. In some such as the black bass and certain cat-fishes both parents do. In a few only the female does. The females of the cat-fishes of the genus *Aspredo*, of Guyana, press the eggs into a spongy

integument of the skin by lying over them, and then carry them about until hatched.

But in most fishes which take care of their young the filial duties, strange to say, devolve upon the males. A very singular instance of this is some of the Pipe-fishes, upon the males of which devolves the duty of caring for the young. On the ventral side of the male is a long groove : the opening of a pouch which is suspended from the fish, and in which the eggs and hatched-out young ones are carried about ; whereas the female does not possess any such pouch, and after depositing the eggs she takes no further care of them.

Again, the male Stickleback constructs a little nest of weeds or other material, which has an entrance at one side. According to Costa, who made a close study of the habits of sticklebacks, and upon whose observations these remarks are in measure based, he then goes in search of a female, whom he conducts to the nest where she lays some eggs. Then she makes her exit by the opposite side of the nest, so that it now has two openings. Next day or so he goes again in search of a female finding perhaps, the same one, or perhaps another, who a second time is escorted to the nest ; and each day this is repeated until the nest contains a goodly number of eggs. Then he assiduously guards them from intruders, including the very female sticklebacks. Nor do his duties cease until the eggs are hatched and the young are able to look out for themselves.

The males of the cat-fishes of the genus *Arius* have another way of taking care of the eggs. The eggs of these fishes are proportionately very large, so that the females lay only a comparatively few. These the male of some, if not all, of the species, carries about in his mouth, or rather in his capacious pharynx ; until hatched.

How the Knotty Question as to the Propagation of the Eel was Solved.

Since Aristotle's time the mode of propagation of the eel has been one of the most knotty questions which has engaged the attention of ichthyologists Aristotle himself gave the subject con

siderable attention, but whilst in many respects the descriptions of that great observer in connection with animals in general would be worthy of a modern zoologist, the nonsense he wrote in endeavouring to solve the intricacies as to the propagation of the eel is hardly worthy of notice; yet his opinion swayed the minds of naturalists for ages.

As late as 1880, or twenty-six years ago, Jacoby wrote as follows in treating of the eel :—

> To a person not acquainted with the circumstances of the case it must seem astonishing, and it is certainly somewhat humiliating to men of science, that a fish which is commoner in many parts of the world than any other fish, the herring perhaps excepted, which is daily seen in the market and on the table, has been able, in spite of the powerful aid of modern science, to shroud the manner of its propagation, its birth, and its death in darkness, which even to the present day has not been completely dispelled.*

Since then more light has come to the students of fishes as to its propagation, and experts have sought to solve the problem, by approaching it along several paths.

More than two hundred years ago a group of ribbon-shaped fish-like creatures were discovered, all the known kinds of which are marine, and it has been proved, within the last two decades, that these are the larval forms, or what we may call the juvenile forms, of different species of eels.

The discovery of ripe eel eggs is due to the researches of Raffaele and Grassi, and dates no further back than 1888, or 18 years ago.

Since 1900, or six years ago, Carl H. Eigenmann, of Bloomington, Indiana, following in the paths opened out of these, and other investigators, has further pursued the subject, and in a pamphlet entitled : "The solution of the Eel question" sums up his conclusions as follows :—

> We now know, (1) that eels, both male and female, migrate to the ocean during October to January ; (2) that these eels probably deposit the eggs that are found on the surface during the following August to January ; (3) that the eels do not ripen in shallow water, but the female, according to Grassi, at a depth of five hundred meters ; (4) that the eggs of the eels float, according to Grassi, at a great depth ; according to Raffaele and Eigenmann at the sur-

*Carl H. Eigenmann : 'The Solution of the Eel Question. Re-printed from 'Transactions of the American Microscopical Society,' Aug., 1901, p. 5.

face; (5) the development of some eels for the first fifteen days and that the resulting creature is different both from the adult eel into which it will develop, and from the larva of the eel; (6) the *Leptocephalus* of the eel and the process of its metamorphosis through a *Hemichthys* stage into the young eel as it is found entering the streams; (7) the young eels enter the streams during spring about two years after their parents have entered the sea. †

Whether they ever do, or do not breed in fresh water is a question still unsolved: and in this connection Eigenmann says:—

The question whether or not the eel ever breeds in fresh water has been answered in the affirmative by several observers. There is nothing that would indicate the adherent impossibility of eels becoming land-locked and breeding in fresh water The evidence is, however, so far inconclusive. No one has yet taken eel eggs or larval eels, or younger eels than those that ordinarily ascend streams from the ocean in any fresh water. The statement that they must breed, because we know of no other way in which the supply of eels is being maintained in land-locked basins is not conclusive evidence that they do breed in these basins. ‡

It would seem, at first thought, incredible that eels from far inland lakes should ever make their way to the sea, (and in the case of the young, *vice versa*, from the sea to the lakes), but their instincts lead them that way at the approach of the spawning time; and doubtless thousands perish in the attempt; but we must bear in mind their serpentile form, their wriggling movements, and the fact that they can live for a considerable time out of water, so that they are enabled to make their way through obstacles utterly insurmountable to other fishes.

They go to the sea when about four years old and are said never to return; the young ones taking their places by ascending the streams in incalculable millions, a comparatively few ever reaching the upland lakes and rivers, but the overcomers make use of swollen tributaries, flood-gates, and even moist places between shut off waters, in getting to the limits of their extensive geographical range.

Brilliant Hues of Fishes of the Coral Reefs.

Naturalists are well acquainted with a phenomenon known as protective coloration in animals. In other words various animals

† Carl H. Eigenmann: I bid: p. 16.
‡ Carl H. Eigenmann: Ibid: p. 17.

so resemble their surroundings as to be disguised either from their enemies or from their prey. According to conditions the hue may be sombre or brilliant. A partridge for instance resembles the dried leaves among which she has her nest, and green parrots resemble the foliage of the trees among which they dwell. Among fishes there are instances both of sombre and brilliant coloration, whereby, in either case, they are concealed. Instances of the latter are certain fishes of the coral reefs. Were these of dull colors, they would readily be seen whilst they moved about among the beautiful flower-like zoophytes ; therefore they are singularly ornamented with colors of surpassing beauty. Incidentally were one asked the question whether a bright red or a jet black object would most readily attract attention, the answer would naturally be the bright red of course. But that depends on conditions. If a scarlet cloth were hung upon the wall, and an object similiarly colored placed against it, it would not readily catch the eye ; but if a jet black object were placed against the red cloth, it would readily be seen. For the same reason, evidently, such beautiful fishes as the tropical chaetodons, and other forms which abound among the coral mounds, are embellished in gorgeous reds, blues, yellows, or greens : colors ordinarily conspicuous, but which offer concealment, more or less, to those fishes amid their natural environments.

THE ANGLER OR SO CALLED FISHING FROG.

A case the opposite to the above is the so called Fishing Frog or Angler. This fish is not readily detected because it is of the sombre hue of its surroundings, and has moreover the power to change its color according to the character of the surroundings. The Angler lurks at the bottom of its retreat with its great gaping mouth ready to devour its prey. A long filament issues from the back of its head, which the angler waves about like a fishing rod. This filament terminates in a bait like lappet, and some unwary little fish which does not see the angler comes to nibble at it, and is at once engulfed in the great gape of this wily creature

THE DISAPPEARANCE OF THE PASSENGER PIGEON.

JAMES H. FLEMING, Toronto, Ont.

The disappearance of the passenger pigeon in Ontario dates back at least forty years, though as late as 1870 some of the old roosts were still frequented, but the incredible flocks, of which so much has been said, had gone long before that date, and by 1880 the pigeon was practically exterminated, not only in Ontario, but over the greater part of its old range. There are, however, occasional records of birds taken, for some years later, an immature bird taken Sept. 9, 1887, in Chester county, Pennsylvania is said to be the last for that part of the state, (1) a bird also immature is in my collection taken in December 1888, at Montreal, Quebec; there are other Montreal records of the same date (2) but with the exception of one taken at Tadousac, July 20, 1889, (3) these are last Quebec records of birds actually taken. In Ontario two were taken at Toronto in 1890, on September 20, and October 11, both immature females, the latter is in my collection, as is an adult female taken by Mr. Walter Brett, at Riding Mountain, Man., May 12, 1892, one of a pair seen. I also have an adult male taken at Waukegon, Ill., Dec. 19, 1892. I was in New York in the latter part of Nov. 1892 and was then assured by Mr. Rowland, a well known taxidermist, that he had recently seen several barrels of pigeons that had been condemned as unfit for food, they had come to New York from the Indian Territory (4) and I believe had had their tails pulled out to permit of tighter packing. Mr. Wm. Brewster has recorded the sending of several hundred dozens of pigeons to the Boston market in December of the same year, and in January, 1893; these were also from Indian Territory; these are the last records we have of the passenger pigeon as any thing more than a casual migrant. The

(1) Proceedings of the Delaware Valley Ornithological Club, II, 1898, 17.
(2) Wintle, Birds of Montreal, 1896, 51.
(3) In collection of Dr. J. Dwight, Jr.
(4) Minot, Birds of New England, 1895, 395.

records ceased after this till 1898 when three birds were taken at points widely apart, an adult male at lake Winnipegosis, Man., on April 14, (5) an immature male at Owensboro, Kentucky, on July 27, now in the Smithsonian Institution, and another immature bird taken at Detroit, Michigan on September 14 (5) is in my collection, these are the last records that can be based on specimens. (6)

In 1903, I published a list (5) including sight records one as late as May 1902, this latter is possibly open to doubt, but the ones I gave for 1900 are, I feel confident, correct, as the birds were seen more than once and by different observers. For all practical purposes the close of the nineteenth century saw the final extinction of the passenger pigeon in a wild state and there remained only the small flock, numbering in 1903 not more than a dozen, that had been bred in captivity by Prof. C. O. Whitman of Chicago. These birds the descendants of a single pair, had long before that ceased to breed and it was in an effort to obtain fresh blood for this flock that I started a newspaper enquiry that brought many replies none of which could be substantiated as records of the passenger pigeon and many referred to the mourning dove. I am aware that there has been lately widely spread and persistant rumours of the return of the pigeons, but no rumour has borne investigation, and I feel that Prof. Whitman's small flock now reduced in 1906 to five birds are the last representatives of a species around whose disappearance mystery and fable will always gather.

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(5) Auk, XX, 1903, 66.

(6) There is a mature female in the collection of the Carnegie Institution of Pittsburg Pa. marked "Pennsylvania" August 15th 1898 but without further locality.

CORRESPONDENCE.

London, Ont., Thursday, Feby. 14, 1907.

To the Editor of the Ottawa Naturalist:

In your issue of May, 1902, I published a notice of the capture of the Longtailed Jaeger at Rondeau. Mr. J. H. Fleming, Toronto, inquired from me about this bird, stating that it was probably the Parasitic Jaeger, not the Lonktailed. After a good deal of correspondance with him and study over the matter I met him recently in Toronto and we went over all the specimans carefully together and as a result I am convinced that he is quite correct and that all the characters upon which stress is laid in the books for the separation of these two species are unreliable.

My birds answer to these characters but the important point which is not mentioned in any of the American books is the color of the primary shafts, the Parasitic Jaeger having white shafts throughout and the Longtail having only the first two or three white and the rest dark.

All the remaining characters seem to vary with individuals to such an extent that they become absolutely worthless for diagnosis. Mr. Howard Saunders, London, England, who is considered the great living authority on the gull family, supplied Mr. Fleming with his information and after the careful examination which he and I made of all the available matter, I am not only satisfied that Mr. Fleming is correct but feel that he should be congratulated on such careful work. When the authorities make mistakes it takes exceptional care to find it out.

W. E. SAUNDERS.

NOTES ON SOME FRESH WATER SHELLS FROM MANITOBA.

By J. F. Whiteaves.

In June, 1906, Professor Macoun collected a few fresh water shells at two localities in Manitoba. The species represented in these collections are as follows, those to which an asterisk is prefixed having been kindly determined by Dr. V. Sterki.

A. *From a small lake four miles and a half due west of Hamiota.*

PELEGYPODA.

**Sphærium* (*Musculium*) allied to *S. securis*, Prime.

Several specimens.

**Pisidium Roperi*, Sterki.

Several specimens.

GASTEROPODA.

Segmentina (*Planorbula*) *Christyi*, Dall.

Six adult and pertect, but dead specimens. This species, which was first described and figured by Dall in 1905, in volume xiii of the "Harriman Alaska Expedition" Reports, was based upon seven specimens, from "High Bluff, Manitoba, (R. Miller Christy)" and "Fort Smith, Mackenzie River (E. A. Preble)," in the United States National Museum. The small lake from which Professor Macoun collected his specimens, is about 104 miles west of High Bluff.

Planorbis (*Torquis*) *parvus*, Say.

Ten specimens.

Physa gyrina? Say.

Four very young specimens.

B. —*From a small lake in the sand hills west of Pine Creek, and north east of Carberry.*

PELECYPODA.

**Pisidium Roperi*, Sterki.
Several specimens.

**Pisidium variabile*, Prime.
Several specimens

**Pisidium medianum*, Sterki.
Four specimens.

**Pisidium ventricosum*, Prime.
Several specimens.

**Pisidium noveboracense*, Prime, var.; (or near).
Three specimens.

**Pisidium*, resembling *P. milium*, Held.
Several specimens.

**Pisidium*, near *P. pauperculum*, Sterki.
Several specimens.

GASTEROPODA.

Planorbis (*Menetus*) *exacutus*, Say.
Several specimens.

Planorbis (*Armiger*) *crista*, L.
One specimen, since broken.

Ottawa, Feb. 9th, 1907.

METEOROLOGICAL OBSERVATIONS.

Taken at the Central Experimental Farm, Ottawa. Maximum, minimum, and mean temperature for each month, with date of occurrence, also, rainfall, snowfall, and total precipitation, in 1906.

Month.	Mean of Maxima.	Mean of Minima.	Range of Means.	General Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation	Number of days Precipitation	Heaviest in 24 hours.	Date.
									in.	in.	in.		in.	
January	28.68	10.17	18.51	19.92	48.0	23	-14.4	10	0.26	9.25	1.18	14	0.35	18
February	25.18	3.26	21.92	14.22	46.0	21	-21.8	2	0.66	7.75	1.43	12	0.50	14, 25
March	30.83	12.87	17.96	21.85	47.0	29	-3.2	24	0.08	7.50	1.72	10	0.92	27
April	54.29	34.85	22.68	46.19	71.6	19	17.0	7	0.78	1.75	0.95	12	0.29	10
May	64.94	40.14	24.80	52.54	80.8	18	28.8	11	1.88	.....	1.88	15	0.45	25
June	77.83	53.96	23.87	65.89	89.0	15 & 20	36.6	12	4.85	.....	4.85	18	1.05	8
July	82.34	56.04	26.29	69.18	93.6	22	44.2	5	1.58	.....	1.58	8	0.62	30
August	84.64	57.07	26.96	70.55	96.6	19	43.5	15	2.43	.....	2.43	9	0.74	20
September	75.86	47.86	28.00	61.86	92.0	12	32.2	25	2.53	. .	2.53	7	1.56	29
October	56.42	35.86	20.55	46.13	75.8	4	24.5	12	3.56	.....	3.56	10	1.22	6
November	38.28	23.87	14.40	31.07	50.0	2	7.4	15	1.01	7.75	1.78	11	0.61	26
December	20.70	3.23	17.46	11.96	38.0	15	-25.2	8	0.84	21.75	3.01	19	0.55	6
									21.36	55.75	26.90	145		

Rain or snow fell on 145 days during the 12 months.
Heaviest rainfall in 24 hours, 1.56 inches on September 29th.
Heaviest snowfall in 24 hours, 5.50 inches on December 6th
The highest temperature during the 12 months, was 96.6 on August 19th.
The lowest temperature during the 12 months, was 25.2 on December 8th.
During the growing season rain fell on 12 days during April, 15 days in May, 18 days in June, 8 days in July, 9 days in August, and 7 days in September.
September shows the lowest number of days with precipitation, viz., 7.
Total precipitation during the 12 months, 26.90 inches, as compared with 32.42 inches during 1905.

RAINFALL, Snowfall, and Total Precipation from 1890 to 1906, also, the Total and the Yearly Average Precipitation for the 17 years.

YEARS.	Rainfall.	Snowfall.	Total Precipitation.
1890	24.73	64.85	31.22
1891	30.19	73.50	37.54
1892	23.78	105 00	34.28
1893	31.79	72.50	39.04
1894	23.05	71.50	30.20
1895	27.01	87.50	35.76
1896	21.53	99.75	31.50
1897	24.18	89.00	33.08
1898	24.75	112.25	35.97
1899	33.86	77.25	41.63
1900	29.48	108 00	40.27
1901	29.21	97.25	38.91
1902	25.94	101.75	36.10
1903	26.43	85.00	34.92
1904	25.95	108.75	36.79
1905	23.71	87.25	32.42
1906	21.36	55.75	26.90
Total for 17 years	446.95	1496.85	596.53
Yearly average for 17 years	26.29	88.05	35.09

RECORD OF SUNSHINE FOR THE YEAR 1906.

MONTH.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
January	20	11	87.5	2.82
February	21	7	132.3	4 72
March	22	9	163.7	5.28
April	27	3	200.8	6.89
May	26	5	201.8	6.50
June	28	2	224.0	7.46
July	31	0	272.4	8.80
August	31	0	273.7	8.82
September	29	1	215.8	7.19
October	25	6	138.6	4.47
November	19	11	95.8	3.19
December	20	11	72.6	2.34

WILLIAM I. ELLIS, *Observer.*

ENTOMOLOGICAL BRANCH.

Meeting No. 3, held at Mr. W. Simpson's house, Jan. 24, 1906: ten present. At the request of Mr. Simpson, Dr. Fletcher acted as Chairman.

Mr Harrington gave an account of the chief characteristics of the Lampyridæ, reading extracts from Dr. Sharpe's article on the subject in the Cambridge Natural History. The phenomenon of luminosity was discussed and several present spoke of having observed this in larval forms. The different groups were considered, and Mr. Simpson exhibited his collection in which most of the Ottawa species were represented. Mr. Harrington read extracts from an article in the January "Entomological News" by Dr. W. A. Riley, giving an account of the remarkable process of polyembryony of *Litomastix truncatellus* as discovered by Prof. Filippo Sylvestri, of Portici, Italy. A most striking feature of this process is that from a single egg there originate in the parasitized larvæ over a thousand individuals of two different types of larvæ, one thousand being of the normal form; and in addition there are about one hundred vermiform asexual larvæ, which lack all trace of circulatory, respiratory, or genital systems or of malpighian tubes. They are, however, provided with strongly developed mouth parts adapted for tearing, and their special function seems to be the breaking down of the organs of the parasitized caterpillar and thus preparing them to serve as nutriment for the sexual forms.

Mr. Gibson exhibited a case containing complete series of inflates illustrating the life histories of *Glaphisia crenata*, *Smerinthus cerysii*, var. *ophthalmicus*, and *Crocigrapha normani*, all of which had been reared from the egg, and larvæ preserved of each stage. Mr. Gibson also read a short article on the Great Leopard Moth, *Ecpantheria deflorata*.

Mr. Young showed a case of 130 different species of geometridæ which he had taken at Ottawa and specimens of all of which had been through the Rev. G. W. Taylor's hands for identification. The most interesting species were pointed out and some facts of their occurrence stated.

Mr. Keele gave an account of his last summer's work in the Klondike country proper, which he explained was not as good a locality for insects as that where he was working in 1905. He showed some most interesting photographs of the country and of animals, which had been taken during the expedition. Some pictures of Dall's Big-horn, a cow moose protecting her two calves, a Canada Lynx, a percupine, and a group of ptarmigan on a mountain side, were much admired. Mr. Keele related some interesting incidents with regard to each picture.

Mr. Nelles, of the Alaska Coast Strip Survey, explained the nature of the country where he was working last summer. A large number of insects had been taken by Mr. Theo. Bryant, an enthusiastic entomologist who was one of the party.

Mr. Baldwin showed the galls of *Eucosoma scudderiana*, a common gall on the Canada Goldenrod, and also the moths, and several parasites. Dr. Fletcher spoke of the checkered history of this species, which by mistake was thought to have been reared by Walsh from willow galls and was originally described under the specific name *saligneana* for this reason. It had been referred to two or three genera at different times but was for the present resting in the genus *Eucosoma*. Mr. Baldwin also exhibited a large specimen of the West Indian Spider usually spoken of as the Banana Tarantula, on account of the frequency with which it is introduced with bunches of that fruit.

Mr. Simpson showed living specimens of the small red lady-bird beetle, *Adalia bipunctata*, and spoke of the enormous abundance of these insects at the present time in the Dominion Astronomical Observatory and during the past summer on the Experimental Farm. This was attributed to the great abundance of plant lice of all kinds in the early part of the season, the lady-bird beetles feeding upon the plant lice and performing a most useful part in the balance of nature. Soon after midsummer it was noticed that the pupæ of the Adalias were infested by minute hymenopterous parasites to such an extent that probably not more than two or three per cent of the pupæ produced beetles.

Dr. Fletcher showed a photograph by Mr. E. A. Carew-

Gibson, of oak trees in the vicinity of Victoria, B. C., which were draped with the silken webs of *Ellopia somniaria*, the Vancouver Island Oak-looper. This photograph was taken in the evening, and the defoliated trees were so hidden by webs made by the caterpillars when letting themselves down from the trees to pupate, as to give the appearance of being looked at through a fog. Specimens of the larvæ and moths were also shown. A paper by the Rev. G. W. Taylor, on some geometers taken at Ottawa between May 24 and June 2, was read, and also a paper by Mr. W. T. Ellis, giving a résumé of the Meteorological Observations taken at the Central Experimental Farm, Ottawa, during 1906. Both of these papers were prepared for the Ottawa Naturalist. J. F.

No. 4, held on Thurday, Feb. 7, 1907, at the residence of Mr. Harrington.

Present:—Messrs. Halkett, Gibson, Fletcher, Eifrig, Baldwin, Young, Metcalfe and Harrington.

Rev. Mr. Eifrig exhibited some lepidoptera from Indiana, consisting of six species of butterflies, including *Papilio ajax*, var. *marcellus*, *Terias nicippe*, and two species of moths. He also showed pupa cases of one of the large dragon flies (*Cordulia* sp.) and also a number of specimens of ants, *Camponotus pictus*, from the stomach of a Pileated Woodpecker shot at Eganville. Dr. Fletcher stated that he had examined the contents of the crop of a ptarmigan, for Mr. Eifrig, and found them to consist entirely of the tips of twigs of willows.

Mr. Baldwin exhibited a box of lepidoptera captured the previous summer, containing 24 species, among which were *Grapta faunus*, *Caripeta divisata*, *Nisoniades lucilius*, *Pamphila metacomet*, *Crambus agitatellus* and *Leucania phragmatidicola*.

Dr. Fletcher showed a small collection of butterflies made by Mr. Lawrence M. Lambe of the Geological Survey, near Kamloops, B. C. Of the five species secured, one fritillary was apparently a new species found by Mr. C. DeBlois Green of Osoyoos, B. C., some years ago but not yet described. He also exhibited an example of the Riker method of mounting insects in glass-topped boxes; the specimens illustrated being *Limneria Guignardi*, Prov., bred from *Ædemasia concinna*, and a spruce twig showing the characteristic galls of *Chermes abietis*, which

had been very abundant for the past two seasons in Western Ontario.

Mr. Halkett read an extract from Wallace on variability in insects, which lead to some discussion on the well known mimicking of certain butterflies by others of different genera.

Mr. Metcalfe reported that he was continuing his work of preparing a list of hemiptera of the locality and exhibited a few species including a very young Ranatra and a winged example of *Coriscus subcoleoptratus*. He also exhibited a female *Prionus Californicus*, which was taken by him on July 31, 1905, at Grierson's Wharf on the Ottawa River about 25 miles from Ottawa. The insect was in flight when observed and captured. It was suggested by Mr. Harrington that the beetle must have come east on one of the train of the C. P. R., which runs down along the Ottawa river. The specimen was compared with examples from Vancouver Isd. and seemed to be identical.

Dr. Fletcher drew special attention to a curious beetle, received from Mr. J. W. Cockle ,of Kaslo, B. C., in a box of very interesting coleoptera, but was unable to furnish the name, as even the genus was unknown to him and to Mr. Harrington. It was thought to belong to the Cupesidæ, as it had many of the characteristics of that family.

Mr. Gibson, showed a good example of the work of a Megachile, the Rose-leaf-cutter Bee, in which several of the cells were visible. He also spoke of a collection of lepidoptera which had been determined for Mr. John Russell, of Digby, N. S. Among the most interesting specimens were the following:—*Thecla lœta*, *Semiophora youngii*, *Mamestra rubefacta*, *Hadena minuscula*, *Hadena bridghami*, *Catocala cœlebs* and *Grapta satyrus*, var. *marsyas*. A specimen was also exhibited of the Lesser Magpie Moth, *Eurrhypara urticata*, collected at Milton, N. S., by Mr. W. H. Moore. This was the first American record for this European insect, which was stated by Dr. Fletcher to have been also taken by Mr. W. McIntosh at St. John, N. B., where it was not uncommon.

Mr. Young exhibited Vol. VI of Sir George Hampson's catalogue of the Phalænæ in the British Museum. The exquisite plates accompanying the volume were much admired by the members and were specially interesting from the many moths figured which had been found in Canada. A large number credited to Colorado in this volume have also been taken in Manitoba, the North-west Provinces and British Columbia. Several of the members availed themselves of the opportunity of examining Mr. Harrington's collections and entomological library.

W. H. H.

NATURE STUDY, No. XLII.

The Relation of Sparrows to Agriculture.

By L. H. Newman, B.S.A., Ottawa.

The relation of Sparrows, as a Class, to Agriculture is very little known, and people have some very erroneous ideas regarding this relationship.

In the first place, the fact that there are several species of sparrows in this country, is known by comparatively few, and thus the inroads committed by the numerous English Sparrows upon our garden and field crops condemn, to a large degree, the whole class.

Now it is evident that a group of birds so abundant, so widely distributed, and in such constant association with farms and gardens must play an important part in rural economy, and that a through investigation of their food habits would be useful. The results of such an investigation are embodied in this paper and amply demonstrate the value of the different birds to the agriculturists.—"A value", says Judd, "greater than that of any other group of birds whose economic status has thus far been investigated."

In order that the different kinds may be easily distinguished, and thereby to assist in preventing the reckless slaughter of beneficial species in mistake for the more injurious English Sparrows, I shall give the chief characteristics of some of the common birds which are known generally as Sparrows.

The following species are common in all parts of Ontario: the English Sparrow; the Chipping Sparrow; the Vesper Sparrow; and the Song Sparrow.

English Sparrow (*Passer domesticus*).

The well-known English, or House Sparrow, is found in almost all parts of the United States and Canada. There is a marked different in the appearance of the males and females but both are well known to all. The note of these birds is anything but musical.

Throughout its range, the English Sparrow abounds chiefly in towns and villages, along roadsides, and about farm buildings, it is seldom found in the open fields, except during the harvest.

The spot chosen for the nest is some hole or crevice in a wall or chimney. Sometimes it is built in tree tops. The nest is very

bulky, and is composed largely of straw and grass. The interior is lined with feathers and other soft material.

The eggs vary in number from four to six, are grayish-white in colour, and are more or less covered with oblong grayish black spots.

CHIPPING SPARROW (*Spizella socialis*).

The Chipping Sparrow is the smallest of all our Sparrows, and may be easily recognized by its red-capped head, a conspicuous light stripe over the eye, and its slate-coloured breast. It may also be identified by its incessant metallic chirp, as it hops about in the grass or hedge-rows, looking for seeds and insects, as well as by its monotonous little song chippy-chippy-chippy, many times repeated.

This species is plentiful in Ontario. The female builds its neat little home in low trees near the habitation of man, and, in fact, often in the vines on his porch. The nest is constructed of grass and is beautifully lined inside with horse hair. The eggs are of a delicate robin's-egg blue, spotted at one end with dark purple. There are two broods of from two to five each year.

VESPER SPARROW (*Poocætes gramineus*).

The Vesper Sparrow is abundant throughout all parts of North America. Fields, grassy hillsides, and open valleys are its places of resort. It is a shy, timid little bird, resembling to a considerable extent the Song Sparrow; but is of grayer brown with a bay-brown patch on each shoulder and the outside feathers of the tail white. It is also known as the Bay-winged Bunting, Ground Bird and Grass Finch. In winter, according to Nuttall, these birds flock together in great numbers in the Southern States; and, mingling with other species, line the roadsides and straggling bushes near the plantations. But no sooner does early spring arrive than they seek out again their nesting regions of the Northern States and Canada. When disturbed, they flit up from the ground, spread their white-bordered tails, and alight a short distance away, to resume their work. This trait is sufficient to identify this species. Their characteristic, attractive song may also be heard during the summer, especially in the late afternoons and evenings.

The female builds her nest on the ground, sheltered by some grassy tuft. The four to six eggs are of a grayish-white, thickly covered with dull, reddish-brown spots.

SONG SPARROW (*Melospiza melodia*).

The Song Sparrows is one of our earliest summer visitor to

appear in the spring, and it is fitting that this, one of our most musical birds, should be so called. Its bright, canary-like lay is one of the most attractive voices of the spring, and is familiar to many who do not know the identity of its author. In habit, it differs from the Chipping Sparrow,—it is not so often met with in the open country or in the garden, but is generally found inhabiting the borders of rivers, meadows, swamps, and other watery places. I have found it, however, in company with the English Sparrows hopping about the barnyard. It seeks its food on the ghound, hopping along through grass and weeds in a peculiar, mouse-like manner.

It is a plump little bird, with dark-brown streaks over its head, and along its sides. The breast is light in colour, boldly streaked with dark-brown and with a conspicuous dark patch in the centre. The beak is stout and dark-coloured. The Song Sparrow resembles the Vesper Sparrow considerably; but is much darker and of a ruddier brown. Its tail is longer and lacks the two white feathers which are such a striking feature of the Vesper Sparrow.

The female generally builds her nest on the ground in a little elevated tuft of grass, or other vegetation. It is composed of fine, dry grass, and is lined with horse-hair and other material. It lays four to five eggs of a bluish-white colour, thickly covered with large reddish-brown spots.

Economic Value of Sparrows.

Some years ago in an effort to arrive at the true relation of these common birds to agriculture, I undertook a rather extensive investigation of the food consumed by the four above named sparrows during one summer. For this purpose of course it was necessary to kill a few specimens each week, throughout the summer, and a most careful examination was made of the stomach, the crop and the gullet of each. From this investigation the following conclusions were drawn regarding the economic importance of each species.

The English Sparrow is almost exclusively a grain and weed-seed eater. Nearly all the insects found in the stomachs of those examined were of a kind practically neutral in their effects on Agriculture.

Now, although it is true that they consume a considerable amount of weed-seeds, yet the fact that they limit their weed-seed eating largely to the barnyard and the immediate vicinity of buildings, lessons to a great degree the benefit which they would otherwise confer upon the farmer.

During harvest, when they can get grain easily, they leave the shelter of buildings and, by thousands, pillage the fields, causing great damage. At this time, very few weed-seeds were found in their stomachs, grain being evidently preferred to weed-seeds when available.

It appears, therefore, that there is little to be said in favour of the English Sparrow. Its weed-seed eating habits are creditable, as far as they go, but they are insignificant because the damage done to grain far overbalances the benefit derived from weed-seed destruction. Adding to this the injury it does about buildings by its filthy habits, and the fact that it drives away other birds beneficial in their habits, there is no escape from the conclusion that this bird is a serious pest, the extermination of which would be an unmixed blessing.

The Chipping Sparrow is not so well known generally as the English Sparrow, but is of much greater benefit to the farmer. Much service is rendered in destroying weed-seeds, but the greatest utility of the species is shown in its animal food, the greater part of which consists of noxious insects. Practically no grain was found in the stomachs examined, although the birds were shot in grain-fields. This, therefore, proves conclusively that they are not injurious to our grain crops.

The Vesper Sparrow, like the Chipping Sparrow, is also very beneficial. Its diet varies with the season. During spring and Fall, when insects are scarcer, its food consists to a large extent of weed-seeds, but during the summer months, its work as a destroyer of injurious insects is very great, measured by the sparrow standard.

Unlike the English Sparrow, it feeds farther out in the field, and hence the weed-seed consumption is a direct benefit. Its value to the farmer is beyond question, and should secure for it the fullest protection. It may be easily distinguished from the injurious English Sparrow by the 2 white feathers in the tail, and it is hoped that people will soon learn to distinguish these two birds, and thereby save many of these useful little songsters from an untimely death.

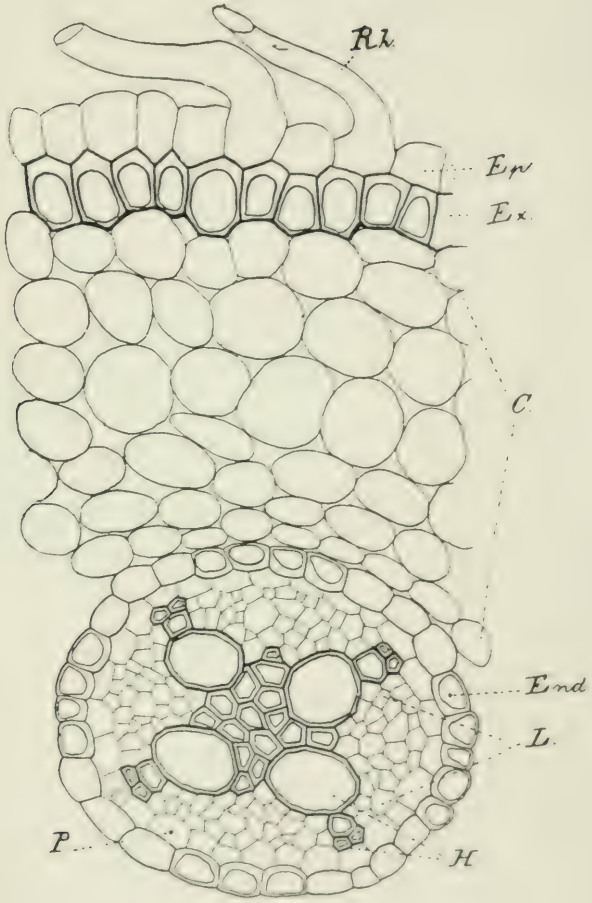
The Song Sparrow also, taking the food habits as a whole, this bird does much more good than harm, and is worthy of protection and encouragement. Its food is composed chiefly of insects, the greater part of which are injurious; it is, however, also a weed-seed destroyer, particularly in autumn. .

Experience has also shown that while this bird will not refuse grain during harvest, yet the injury caused in this way is inconsiderable.

INDEX

TO THE

OTTAWA NATURALIST, VOL. XX, 1906-7.



Holm : On structure of roots.